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United States Department of the Interior

NATIONAL PARK SERVICE
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IN REPLY REFER TO:

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SEP 13 1996

Memorandum

To: Field Area Directors
Attention: Park Superintendents and Center Managers

From: Associate Director, Cultural Resource Stewardship and Partnerships *U. Stew*

Subject: Issuance of *Museum Handbook*, Part I, Museum Collections,
Revised Chapter 9 and Appendices E and G and New Appendices R and S

We are pleased to issue the following revised and new chapters and appendices for NPS *Museum Handbook*, Part I, Museum Collections:

- Revised Chapter 9, Museum Collections Security and Fire Protection
- Revised Appendix E, Scope of Collection Statement
- Revised Appendix G, Protection of National Park Service Museum Collections
- New Appendix R, Curatorial Care of Photographic Collections
- New Appendix S, Curatorial Care of Objects Made from Leather and Skin Products

See Attachment 1 for a summary of the content of these chapters and appendices.

Please remove the existing Chapter 9 and Appendices E and G and insert the revised chapter and appendices and the new appendices into the NPS *Museum Handbook*, Part I. The chapters and appendices are written in the new "Plain English" style and format for your convenience and ease of reading. Additional copies are available from the Museum Supply and Equipment Program, Museum Management Program, Harpers Ferry Office.

A revised Introduction, Acknowledgement Section, Table of Contents, and List of Figures also is included for Part I of the handbook.

We thank the authors, Museum Handbook Part I Working Group, and the Museum Management Program Council for their contributions to the development of this guidance material.

Attachments

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Attachment 1 - Content of 1996 NPS Museum Handbook, Part I Issue

Revised Chapter 9, Museum Collections Security and Fire Protection: Provides updated guidance on identifying threats to museum collections; assessing the risks of loss; selecting and implementing actions to correct problems; and measuring the effectiveness of corrective actions. It includes charts that describe different types of fire and intrusion detection devices.

Revised Appendix E, Scope of Collection Statement: Contains a revised checklist for evaluating a Scope of Collection Statement (SOCS) and a revised approved example SOCS. An unpunched full size version of the checklist is included for your immediate use.

Revised Appendix G, Protection of National Park Service Museum Collections: Contains information that supports guidance provided in the revised Chapter 9. It describes standards for museum security and fire protection; defines security and fire protection terms; and provides sample statements of work, standard operating procedures, and agreements. Appendix G contains a sample visitor log and conditions for using museum collections. An unpunched full size version of these materials is included at the end of the appendix for your immediate use.

New Appendix R, Curatorial Care of Photographic Collections: Identifies the nature of photographic materials; provides guidance on handling, storing, housing exhibiting, and inspecting these materials; provides guidance on developing a preservation strategy for photographic collections; discusses conservation treatment options; and provides guidance on managing these collections during an emergency situation. This appendix includes an unpunched full size version of a checklist for evaluating the condition of these materials.

New Appendix S, Curatorial Care of Objects Made from Leather and Skin Products: Identifies the agents of deterioration that pose the greatest risk to these materials; describes measures that can be taken to prevent or minimize the impact of these agents; and discusses techniques for handling, marking, storing, and cleaning of these objects.

INTRODUCTION

The *Museum Handbook* covers a myriad of topics to guide National Park Service staff in managing museum collections. In Part I all disciplines and materials represented by NPS collections are covered as well as professional ethics and a variety of circumstances from specialized storage, to exhibit environment standards, to conservation treatments, to emergency preparedness. In Part II the standard procedures for museum record keeping, including accessioning, cataloging, loans, and photography, as well as deaccessioning, recording losses and reporting annual collection management data are given. Part III, to be issued in the future, will provide guidance on the use of collections for exhibits, interpretation, and research. It will also provide guidance on the care of collections requiring specialized attention, such as sensitive and sacred Native American objects.

Beginning in 1995, we adopted a new writing style to improve readability and ease of reference. We will issue all new or revised chapters in this format; however, chapters and appendices will remain in their current format until content revisions are needed.

In spite of the extensive and detailed information provided, the *Museum Handbook* cannot be considered a stand-alone prescription for action. The expertise and judgment of the curatorial staff and others, such as conservators, who may be called upon for advice, are the most essential ingredients to effective preservation and management of the collections. Those individuals making collection management decisions will need to consult the *Museum Handbook*, draw on their own knowledge and that of specialists, seek additional information in the references listed in each chapter of the *Museum Handbook* and, as appropriate, request advice or technical assistance from preservation centers, system support offices, or the National Center for Cultural Resources Stewardship and Partnership Programs. Diligent use of these sources and reasoned decision-making by adequately trained staff should ensure that the National Park Service collections will be, as mandated by the 1916 NPS Organic Act, preserved and maintained for the use and enjoyment of future generations.

Ann Hitchcock
Chief Curator
Museum Management Program
National Center for Cultural Resources
Stewardship and Partnership Programs
September 1996

ACKNOWLEDGEMENTS

The preparation of the NPS *Museum Handbook*, Part I, has been coordinated by the Museum Management Program, National Center for Cultural Resources Stewardship and Partnership Programs. **(On October 1, 1995, the Curatorial Services Division, Washington Office was restructured to become the Museum Management Program (MMP) in the National Center for Cultural Resources Stewardship and Partnership Programs.)** Support in providing technical information and in writing chapters or sections of chapters has come from curatorial staff in the Museum Management Program, parks and system support offices; and from conservators at Harpers Ferry Center and in collection centers. Conservators from the Smithsonian Institution, the National Gallery of Art, and the University of Delaware also contributed to the handbook.

Members of the NPS Museum Handbook Steering Committee who coordinated the writing of the topics for the 1990 revision include: John Clonts, Handbook Committee Chair and Chief, Museum Collections Repository, Western Archeological and Conservation Center; Tom Carter, Conservator, Harpers Ferry Center; Lynne Leopold-Sharp, Museum Curator at Minuteman NHP; John Hunter, Regional Curator, Midwest Region; Ellen Seeley, Curator, Glacier National Park; Bill Gregg, National Park Service Man and Biosphere Coordinator, Washington Office; and Ann Hitchcock, Chief Curator, Washington Office.

In 1994, a revised Chapter 2, Scope of Museum Collections and Appendix A, Mandates and Standards for NPS Museum Collections Management were issued. Members of the NPS Museum Handbook, Part I Working Group who coordinated the writing of the 1994 and 1996 issues include: Kent Bush, Curator, Columbia Cascades and Pacific Islands System Support Offices; Al Levitan, Conservator, Division of Conservation, Harpers Ferry Center; Anne Jordan, Museum Curator, Roosevelt-Vanderbilt National Historic Sites; Danny McDaniel, Director, Security, Safety, and Transportation, The Colonial Williamsburg Foundation; Carolyn Richard, Museum Curator, Grand Canyon National Park, and Brigid Sullivan, Supervisory Conservator, Northeast Field Area Cultural Resources Center.

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Chapter 12 - Tony Knapp

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Appendix S (1996) - Toby Raphael

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TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	
1. NATIONAL PARK SERVICE MUSEUMS AND COLLECTIONS	
A. Purpose of National Park Service Museums	1:1
B. History of National Park Service Museums	1:4
C. National Park Service Museum Collections	1:11
D. Introduction to NPS Museum Collections Management	1:20
E. Planning for Park Museum Collections	1:23
F. Professional Considerations	1:29
G. Selected Bibliography	1:35
H. Endnotes	1:41
2. SCOPE OF MUSEUM COLLECTIONS (1994)	
A. Introduction	2:1
B. The Scope of Collection Statement	2:3
C. Writing the Scope of Collection Statement	2:5
D. Implementing the Scope of Collection Statement	2:26
E. Acquisition Policies and Criteria for Museum Objects	2:30
F. Determining the Value of Museum Objects	2:35
G. Selected Bibliography	2:43
3. MUSEUM OBJECTS PRESERVATION: GETTING STARTED	
A. Introduction to Museum Objects Preservation	3:1
B. Establishing an Object Conservation Program	3:4
C. The Collection Management Plan	3:7
D. The Collection Condition Survey	3:10
E. The Structure that Houses Museum Objects	3:14
F. Glossary	3:15
G. Selected Bibliography	3:17
H. Endnotes	3:19
4. MUSEUM COLLECTIONS ENVIRONMENT	
A. The Agents of Deterioration	4:1
B. Developing the Critical Eye	4:4
C. Temperature and Relative Humidity	4:9
D. Monitoring and Controlling Relative Humidity and Temperature	4:15
E. Light	4:37
F. Dust and Gaseous Air Pollution	4:47
G. Selected Bibliography	4:56
H. Endnotes	4:58
5. BIOLOGICAL INFESTATIONS	
A. Introduction to Biological Infestations	5:1
B. Identifying Museum Pests	5:3
C. Establishing a Museum Integrated Pest Management Program	5:28
D. Action to Take When an Infestation is Discovered	5:37
E. Glossary	5:41
F. Selected Bibliography	5:43

6. HANDLING, PACKING AND SHIPPING MUSEUM OBJECTS

A. Importance of Proper Handling	6:1
B. Practices to Ensure Object Safety	6:2
C. General Rules for Handling Museum Objects	6:5
D. Rules for Moving Museum Objects	6:7
E. Importance of Proper Packing and Shipping	6:9
F. Preparation for Packing and Shipping Objects	6:10
G. Packing the Object	6:12
H. Shipping the Object	6:20
I. Selected Bibliography	6:23

7. MUSEUM COLLECTIONS STORAGE

A. Introduction to Museum Collections Storage	7:1
B. NPS Museum Collections Storage Requirements	7:3
C. Museum Collections Storage Planning	7:8
D. Housing Museum Objects	7:20
E. Selected Bibliography	7:25

8. MUSEUM OBJECT CONSERVATION TREATMENT

A. Introduction to Museum Object Conservation Treatment	8:1
B. Factors to Consider Before Object Treatment	8:4
C. Documentation of Object Conservation Treatment	8:8
D. Obtaining the Services of a Conservator	8:17
E. Contracting for Conservation Services	8:24
F. Emergency Conservation Treatment and Handling	8:31
G. Selected Bibliography	8:35

9. MUSEUM COLLECTIONS SECURITY AND FIRE PROTECTION (1996)

A. Overview	9:1
B. Legal, Regulatory and Policy Requirements	9:3
C. Measuring the Effectiveness of a Security System	9:6
D. Fire Protection	9:12
E. Operational Security	9:23
F. Physical Security	9:30
G. Electronic Security Systems	9:34
H. Protecting Collections in Transit	9:43
I. Reporting and Recovering Stolen Museum Objects	9:44
J. Museum Collection Records	9:46
K. Selected Bibliography	9:47
L. Endnotes	9:48

10. MUSEUM COLLECTIONS: EMERGENCY PLANNING

A. Introduction	10:1
B. Objectives of Emergency Planning	10:2
C. Hazards to Museum Collections	10:3
D. Protecting Museum Collections From Disasters	10:9
E. Preparing the Emergency Plan for Museum Collections	10:10
F. Guide to Emergency Supplies and Equipment	10:19
G. Glossary	10:23
H. Selected Bibliography	10:25
I. Endnotes	10:29

11. CURATORIAL HEALTH AND SAFETY ISSUES

A. Introduction to Curatorial Health and Safety	11:1
B. Methods for Controlling Improper Exposure to Hazardous Substances	11:5
C. Hazardous Chemicals/Materials Used in Collections Care	11:11
D. Hazardous Objects in the Collections	11:26
E. Safety Rules for Lifting and Carrying	11:36
F. Workspace Conditions	11:38
G. Glossary	11:41
H. Selected Bibliography	11:44
I. Endnotes	11:47

12. CURATORIAL PROGRAMMING, FUNDING, AND STAFFING

A. Programming for Museum Collections Management	12:1
B. Sources of Curatorial Funding	12:5
C. Staffing for Museum Collections Management	12:7
D. Example Curatorial Programming Documents	12:9

APPENDICES

Page

A.	MANDATES AND STANDARDS FOR NPS MUSEUM COLLECTIONS MANAGEMENT (1994)	
A.	Laws, Regulations, and Conventions	A:1
B.	Departmental Policies and Standards for Museum Property	A:10
C.	NPS Management Policies for Museum Objects	A:12
D.	NPS Servicewide Standards for Managing Museum Objects	A:16
E.	Mandate and Policy for NPS Integrated Pest Management Program	A:18
B.	NATIONAL PARK SERVICE APPLICATION PROCEDURES FOR ACCREDITATION OF PARK MUSEUM OPERATIONS BY THE AMERICAN ASSOCIATION OF MUSEUMS (1987)	
A.	Introduction	B:1
B.	NPS Application Procedures for AAM Accreditation	B:2
C.	PROFESSIONAL ORGANIZATIONS AND SOCIETIES	
A.	Organizations and Societies	C:1
B.	Museum Journals and Technical Publications	C:4
C.	Funding Organizations	C:5
D.	CODE OF ETHICS FOR CURATORS, ARCHIVISTS, AND CONSERVATORS	
A.	American Association of Museums Code of Ethics for Curators	D:1
B.	Society of American Archivists Code of Ethics for Archivists	D:2
C.	American Institute for Conservation Code of Ethics and Standards of Practice for Conservators	D:4
E.	SCOPE OF COLLECTION STATEMENT (1996)	
A.	Overview	E:1
B.	Evaluating Your Scope of Collection Statement	E:1
C.	List of Figures	E:2
F.	NPS MUSEUM COLLECTIONS MANAGEMENT CHECKLISTS	
A.	NPS Checklist for Preservation and Protection of Museum Collections	F:1
B.	NPS Collection Management Plan Team Site Visit Checklist	F:39
C.	NPS Checklist of Reference Documents for Collection Management Plan Team	F:47
G.	PROTECTION OF NATIONAL PARK SERVICE MUSEUM COLLECTIONS	
A.	Overview	G:1
B.	NPS Standards for Security and Fire Protection	G:1
C.	Museum Security and Fire Protection Surveys	G:3
D.	Park Museum Standard Operating Procedures and Agreements	G:6
E.	Mandates and Requirements for Emergency Management for Museum Collections	G:8
F.	Glossary	G:9
G.	List of Figures	G:14
H.	CURATORIAL HEALTH AND SAFETY	
A.	Laws, Regulations, and NPS Policies and Guidelines	H:1
B.	Sources of Assistance	H:3
C.	Comparison of Types of Ventilation Systems	H:5
D.	Sources of Health and Safety Equipment and Supplies	H:6
E.	List of Fumigants Used in Museums	H:10

I. CURATORIAL CARE OF ARCHEOLOGICAL OBJECTS

A. The Nature of Archeological Material	I:1
B. Handling Archeological Materials	I:3
C. Cleaning Archeological Objects	I:4
D. Preventive Care: Environmental Requirements	I:5
E. Preventive Care: Storage of Archeological Objects	I:8
F. Recommended Storage Materials	I:22
G. Selected Bibliography	I:28

J. CURATORIAL CARE OF PAPER OBJECTS

A. Introduction	J:1
B. The Nature of Paper	J:3
C. Agents of Deterioration	J:7
D. Preventive Conservation	J:12
E. Conservation Treatment Issues	J:44
F. Emergency Procedures for Paper Objects	J:48
G. Glossary of Terms Used to Describe Condition	J:49
H. Curatorial Care Checklist for Paper Objects	J:51
I. Selected Bibliography	J:52
J. Endnotes	J:55

K. CURATORIAL CARE OF TEXTILE OBJECTS

A. Introduction	K:1
B. The Nature of Textile Objects	K:3
C. The Nature of Textile Deterioration	K:12
D. Preventive Conservation: Environment, Pests, and Handling	K:19
E. Preventive Conservation: Storage	K:26
F. Preventive Conservation: Exhibit	K:38
G. Textile Object Conservation Issues	K:44
H. Packing and Shipping Textile Objects	K:50
I. Emergency Procedures for Textile Objects	K:51
J. Summary Checklist for Textile Care	K:53
K. Selected Bibliography	K:55
L. Sources of Information and Supplies	K:59

L. CURATORIAL CARE OF PAINTINGS

A. Introduction	L:1
B. The Nature of Paintings: Structure and Problems	L:2
C. Preventive Conservation of Paintings	L:5
D. Emergency Procedures for Paintings	L:11
E. Selected Bibliography	L:12

M. CURATORIAL CARE OF CELLULOSE NITRATE NEGATIVES

A. Introduction	M:1
B. The Nature of Cellulose Nitrate Film	M:2
C. Identification and Isolation of Cellulose Nitrate Negatives	M:4
D. Steps to Minimize Health Risks	M:10
E. Duplication of Nitrate Negatives	M:11
F. Packing and Shipping Nitrate Negatives	M:14
G. Disposition of Interpositives and Duplicate Negatives	M:15
H. Retaining Original Nitrate Still Negatives After Duplication	M:16
I. Long-Term Storage of Original Nitrate Negatives	M:17

	<u>Page</u>
J. Disposing of Deteriorated Original Nitrate Negatives	M:20
K. Selected Bibliography	M:21
N. CURATORIAL CARE OF WOODEN OBJECTS	
A. Introduction	N:1
B. The Nature of Wood	N:3
C. Agents of Deterioration	N:9
D. The Nature of Furniture	N:18
E. Preventive Conservation	N:31
F. Wooden Objects Conservation Issues	N:45
G. Emergency Procedures for Wooden Objects	N:51
H. Selected Bibliography	N:53
O. CURATORIAL CARE OF METAL OBJECTS	
A. Introduction	O:1
B. The Nature of Metals	O:3
C. Agents of Deterioration	O:17
D. Preventive Conservation	O:19
E. Metal Objects Conservation Issues	O:27
F. Emergency Procedures for Metal Objects	O:28
G. Glossary	O:29
H. Selected Bibliography	O:34
I. Endnotes	O:35
P. CURATORIAL CARE OF CERAMIC, GLASS, AND STONE OBJECTS	
A. Introduction	P:1
B. The Nature of Ceramics, Glass, and Stone	P:2
C. Agents of Deterioration	P:15
D. Preventive Conservation	P:19
E. Care of Composite Ceramic and Glass Objects	P:28
F. Ceramic, Glass, and Stone Object Conservation Issues	P:32
G. Packing and Shipping Glass, Ceramic, and Stone Objects	P:35
H. Emergency Procedures for Ceramic, Glass, and Stone Objects	P:39
I. Selected Bibliography	P:41
J. Source List	P:43
K. Endnotes	P:44
Q. CURATORIAL CARE OF NATURAL HISTORY COLLECTIONS	
(To be released at a future date)	
R. CURATORIAL CARE OF PHOTOGRAPHIC COLLECTIONS (1996)	
A. Overview	R:1
B. The Nature of Photographic Materials	R:1
C. Preparing a Preservation Strategy	R:5
D. Preventive Conservation: Handling Photographic Collections	R:11
E. Preventive Conservation: Storing Photographic Collections	R:15
F. Preventive Conservation: Housing Photographic Collections	R:19
G. Preventive Conservation: Exhibiting Photographic Collections	R:30
H. Preventive Conservation: Inspecting Photographic Collections	R:32
I. Conservation Treatment Issues for Deteriorated Photographic Materials	R:33
J. The Recovery of Water-Damaged Photographic Materials	R:40
K. Selected Bibliography	R:41

S. CURATORIAL CARE OF OBJECTS AND SKIN PRODUCTS MADE FROM LEATHER (1996)	
A. Overview	S:1
B. The Nature of Leather and Skin Products	S:2
C. Agents of Deterioration	S:7
D. Preventive Conservation: Guidelines for Leather and Skin Object Care, Handling, and Storage	S:12
E. Summary: Leather and Skin Product Deterioration and Preventive Care	S:19
F. Conservation Treatment Issues	S:20
G. Selected Bibliography	S:22

LIST OF FIGURES

Figure Number	Caption	Page
2.1	Title Page Format for Scope of Collection Statement	2:6
2.2	Sample Format for Museum Objects Location Record	2:28
2.3	Sample Format for Photographs and Paintings Location Record	2:29
2.5	Sample of Written Appraisal	2:41
3.1	Curator and Conservator Roles in Object Conservation Management	3:5
4.1	The Agents of Deterioration	4:3
4.2	How to Use a Psychrometric Chart	4:12
4.3	Relative Humidity Optimum Ranges for Various Materials Housed in a Park's Museum Collection	4:14
4.4	Hygrothermograph Calibration Record	4:23
4.5	Hygrothermograph Chart that Illustrates the Relationship Between Temperature and Relative Humidity	4:25
4.6	Hygrothermograph Chart that Indicates Operation of Air Handling Equipment	4:26
4.7	Hygrothermograph Chart that Illustrates the Results of Turning Off the Furnace	4:27
4.8	Museum Environmental Monitoring Record	4:30
4.9	Maximum Acceptable Illuminance Level for Light Sensitive Materials	4:39
4.10	Light and Heat Measurement Record	4:44
4.11	Deterioration to Museum Objects Caused by Air Pollution	4:51
4.12	Materials Known to Release Harmful Vapors and Materials that Appear to be Safe	4:54
5.1	Example Museum Integrated Pest Management Survey Form	5:31
6.1	Proper handling techniques are essential to museum housekeeping practices	6:1
6.2	The use of equipment and supplies such as carts and trays minimizes the need to handle objects	6:2
6.3	Equipment and supplies for handling museum objects include trays, padding, tissue, gloves, and carts	6:3
6.4	An evaluation of this statue's structural characteristics resulted in the use of foam padding and a tray to increase protection before handling and moving the object	6:3
6.5	Use two hands and clean white gloves when handling museum objects	6:5
6.6	Pad moveable parts and separate objects of more than one piece to avoid damage during handling	6:6
6.7	A teapot should be handled by the base rather than the handle or spout	6:7
6.8	These pipe bowls were placed in individual specimen trays within a larger tray to prevent damage during movement	6:7
7.1	Levels of a Museum Storage System	7:1
7.2	General Floor Plan of Proposed Museum Collection and Library Center at Grand Canyon National Park	7:11
7.3	Floor Plan of Proposed Museum Collection Space at Grand Canyon National Park	7:12
7.4	Floor Plan of Museum Collection Storage Room at Voyageurs National Park	7:13
7.5	Cavity storage technique used to house small objects in a standard museum cabinet drawer	7:22

<u>Figure Number</u>	<u>Caption</u>	<u>Page</u>
7.6	Wardrobe museum cabinet storage assemblies that are designed to house rolled textile objects	7:22
7.7	Larger objects housed on steel shelving	7:23
7.8	A five-drawer map cabinet with a map enclosed in an acid-free document folder	7:23
7.9	Slotted angle iron can be used to construct racks for furniture and other large objects	7:24
7.10	Painting/framed objects rack constructed of slotted angle iron and 2" mesh welded wire fencing	7:24
8.1a	Sample Conservator's Examination Report	8:11
8.1b	Sample Conservator's Examination Report (continued)	8:12
8.2a	Sample Conservator's Treatment Proposal	8:13
8.2b	Sample Conservator's Treatment Proposal (continued)	8:14
8.3a	Sample Conservator's Treatment Report	8:15
8.3b	Sample Conservator's Treatment Report (continued)	8:16
8.4	Example Object Treatment Request (OTR) Form 10-252	8:23
9.1	Security Bullseye	9:2
9.2	Threats to Museum Collections	9:6
9.3	Major Causes of Museum Fires	9:13
9.4	Types of Fire Detectors	9:17
9.5	Types of Intrusion Detection Devices	9:39
10.1	Hazards that can cause emergencies and disasters	10:5
11.1	Pest Control Program Report Form 10-21A	11:16
11.2	Sample Hazardous Chemical Inventory Sheet	11:18
11.3a	Sample Material Safety Data Sheet (front)	11:21
11.3b	Sample Material Safety Data Sheet (back)	11:22
11.4	The NFPA Hazard Symbol.	11:23
11.5	The NFPA Hazard Symbol: Key to Color Code and Numbering System	11:24
11.6	Recommended Actions for Levels of Radon	11:39
A.1	Museum Properties Act of 1955	A:3
A.2	References to Museum Collections Management in IPMR	A:10
A.3	Presidential Memorandum Directing Federal Agencies to Establish an IPM Program	A:19
E.1	Example Approved Scope of Collection Statement	E:3
E.2	Checklist for Evaluating Scope of Collection Statements	E:22
F.1	Cost Estimates (1996)	F:7
F.2	NPS Checklist for Preservation and Protection of Museum Collections	F:11
G.1	Sample Scope of Work for a Security Survey	G:15
G.2	Sample Scope of Work for a Fire Protection Survey	G:20
G.3	Sample Furnished Historic Structure Opening and Closing Procedures	G:25
G.4	Sample Museum Collections Storage Opening and Closing Procedures	G:28
G.5	Sample Park Museum Collection Access Policy and Procedures	G:29
G.6	Sample Visitor Log	G:32

<u>Figure Number</u>	<u>Caption</u>	<u>Page</u>
G.7	Conditions for Access to Museum Collections	G:33
G.7	Sample Memorandum of Understanding Between a Park and a Fire Company	G:34
I.1	Deterioration Through Time of Archeological Objects	I:2
I.2	Vertical Stacking of Small Objects Within Standard Containers	I:12
I.3	Organization and Layering of Objects within a Storage Box	I:14
I.4	An Easily Made Support Tray for Fragile Material	I:16
I.5	Customized Support Blocks for a Fragile Glass Bottle to be Fitted in a Museum Specimen Tray	I:17
I.6	Cavity Packing Technique for Small Objects	I:19
I.7	Construction of a Cradle Mount for Objects with Round Bases	I:20
I.8	Construction of a Portfolio Mount for Archeological Textile Fragments	I:21
J.1	A Sample Separation Sheet	J:16
J.2	Curatorial Condition Report for Paper Objects	J:41
J.3a	Condition of Paper Collections: Group Survey Report	J:42
J.3b	Condition of Paper Collections: Group Survey Report (Example)	J:43
K.1	Surface Cleaning Flat Textile with a Vacuum Source	K:27
K.2	Rolled Storage of Flat Textiles	K:30
K.3	Tape Supports for Costume	K:34
K.4	Frame Construction for Small Flat Textiles	K:41
L.1	Steps for Attaching Picture Wire to a Frame's Hanger	L:7
M.1	Types of Kodak Nitrate Film and Last Year of Manufacture	M:4
M.2	NFPA Hazard Warning Sign for Cellulose Nitrate Film	M:18
N.1	Typical Tree Stem Cross Section	N:4
N.2	The Three Principal Planes or Surfaces of a Typical Block of Wood: Tangential, Radial, and Cross Section	N:6
N.3	Graph Illustrating the Relationship Between Relative Humidity and Equilibrium Moisture Content of Wood	N:8
N.4	Characteristic Shrinkage and Distortion of Wood (Viewed from the Transverse Plane)	N:11
N.5	Typical Mortise and Tenon Joint	N:19
N.6	Typical Dovetail Joint	N:21
N.7	Common Veneer Applications	N:24
N.8	Proper Techniques for Moving Furniture	N:42
O.1	List of Several Brass Alloys	O:10
O.2	List of Bronze Alloys	O:11
O.3	List of Pewter Alloys	O:12
O.4	List of Silver Alloys	O:13
P.1	Method of Stabilizing Objects in Storage	P:24
P.2	Flush Mount for Hanging Heavy Mirrors	P:30
P.3	Technique for Wrapping a Fragile Object	P:36
P.4	Layered Foam Packing for Fragile Objects	P:38

<u>Figure</u> <u>Number</u>	<u>Caption</u>	<u>Page</u>
R.1	Appropriate Light Levels for Photographic Media	R:7
R.2	Relative Humidity and Temperature Requirements for Photographic Media	R:16
R.3a-b	Condition Checklist for Visual Images (Sample)	R:34
S.1	The Structure of Skin	S:2
S.2	Degrees and Types of Tannage	S:3
S.3	Characteristics of Leather and Skin Products	S:4
S.4	Thickness of Skins and Hides	S:5
S.5	Cleaning Techniques for Leather and Skin Objects in Good Condition	S:15
S.6	Constructing a Saddlemount	S:18
S.7	Leather and Skin Product Deterioration and Preventive Care	S:19

CHAPTER 9: MUSEUM COLLECTIONS SECURITY AND FIRE PROTECTION

	<u>Page</u>
A. Overview	9:1
What is a comprehensive security system?	9:1
How should I design an effective security system?	9:1
Who is responsible for security?	9:2
What information will I find in this chapter?	9:2
B. Legal, Regulatory and Policy Requirements	9:3
What laws and regulations do I need to know?	9:3
Which parts of the Department of the Interior's Manual address protecting museum collections?	9:3
Which NPS Management Policies address protecting museum collections?	9:3
Which NPS special directives address protecting museum collections?	9:4
Which NPS guidelines address protecting museum collections?	9:4
C. Measuring the Effectiveness of a Security System	9:6
What are the threats to museum collections?	9:6
What is risk assessment?	9:6
How do I conduct a risk assessment?	9:8
How can I limit the risk?	9:8
How often should I assess risk and what tools are available?	9:9
How do I conduct a self-assessment?	9:9
What is a security survey?	9:10
How should I prepare for a survey?	9:10
What should the survey report include?	9:11
What is the final and most important step?	9:11
D. Fire Protection	9:12
Who is responsible for fire protection?	9:12
What are the precautions for construction and renovation?	9:13
What about open flames in structures?	9:13
What's the threat from fires?	9:14
What should a structural fire plan cover?	9:14
How do I limit fire risk?	9:15
What constitutes a good fire prevention program?	9:15
Is a fire detection system essential?	9:15
Who should monitor a detection system?	9:16
Why should I contact the local fire service provider?	9:16
What types of fire detectors are available?	9:17
What about maintenance and testing?	9:17
How important is fire suppression?	9:18
Are fire extinguishers enough?	9:18
Who should know how to use a fire extinguisher?	9:18
What is the most common type of extinguisher?	9:18
What about Halon extinguishers?	9:19
What are the maintenance and testing requirements?	9:19
What about standpipe and hose systems?	9:19
What about sprinkler systems?	9:19
What about water damage and accidental discharges?	9:20
What about other automatic suppression systems?	9:20
What do I need to know about installing mobile compact shelving?	9:21
What about salvage after the fire?	9:21

Where can I get help?	9:22
E. Operational Security	9:23
What are some of the design issues I should consider?	9:23
What should I cover in our day-to-day operational policies and procedures?	9:24
What should I include in an access policy?	9:24
What else should I do regarding access?	9:24
Why should I be concerned about key control?	9:25
How do I control keys?	9:25
What should I do to safeguard keys?	9:26
What about access to keys in emergencies?	9:26
How do I ensure accountability?	9:26
What should I do if a key is lost or stolen?	9:26
Are combination locks better than keyed locks?	9:26
What should I include in opening and closing procedures?	9:27
What else should I include in the opening and closing procedures?	9:28
What about the park's crime prevention and physical security plans?	9:28
What should I include in the Emergency Operations Plan?	9:29
What should I include in staff training?	9:29
Where can I get help?	9:30
F. Physical Security	9:30
What is physical security?	9:30
What are the tools of physical security?	9:31
Why do I need barriers?	9:31
How many barriers are enough?	9:31
Why do I need locks?	9:32
What criteria should I use in selecting locks?	9:32
What is required for museum storage spaces?	9:32
Why is an effective lighting system important?	9:33
Is lighting always necessary?	9:33
What about light for closed circuit television (CCTV)?	9:33
What is the value of human presence?	9:33
Where can I get help?	9:33
G. Electronic Security Systems	9:34
What is the threat?	9:34
How vulnerable is the collection?	9:34
Are there restrictions on the installation?	9:34
What should the system do?	9:35
What factors influence a system's design?	9:36
What are the types of intrusion detection devices?	9:38
What are the most common causes of a false alarm?	9:42
What can I do to reduce the number of false alarms?	9:42
What are other design considerations?	9:42
Where can I get help?	9:43
H. Protecting Collections in Transit	9:43
What are the object's characteristics?	9:43
What means of transportation should I select?	9:43
How should objects be handled in transit?	9:44
Is chain of custody important?	9:44
What about intermediate stops?	9:44
What about delivery time?	9:44
Where can I get help?	9:44

I. Reporting and Recovering Stolen Museum Objects	9:44
What should I do if I suspect a theft?	9:45
How do I report a theft to outside agencies	9:45
How should I handle the news media after a theft?	9:46
J. Museum Collection Records	9:46
Why are the records important?	9:46
When should I use the camera?	9:46
Should I review my museum records protection program?	9:46
Where can I get help?	9:47
K. Selected Bibliography	9:47
L. Endnotes	9:48
List of Figures	
Figure 9.1 Security Bullseye	9:2
Figure 9.2 Threats to Museum Collections	9:6
Figure 9.3 Major Causes of Museum Fires	9:13
Figure 9.4 Types of Fire Detectors	9:17
Figure 9.5 Types of Intrusion Detection Devices	9:39

CHAPTER 9: MUSEUM COLLECTIONS SECURITY AND FIRE PROTECTION

A. Overview

As hard as we try, nothing lasts forever. Still, an effective preservation program can delay the inevitable. Preventive conservation can slow the rate of loss to natural, expected causes, while a comprehensive security system can help limit losses from unexpected causes, such as fire, theft, natural disasters, and accidental damage. Security and fire protection are as important to the long-term survival of a collection as proper curation, storage, and conservation and must be an integral part of the day-to-day care of the collection.

1. *What is a comprehensive security system?*

A comprehensive security system combines policies, procedures, personnel and hardware to protect museum collections from unexpected losses caused by crime, negligence, fire, or other catastrophic events. Four concepts are implicit in such a system:

- The park itself is a system, and security is one of its subsystems.
- Identifying objectives precisely and clearly is the most important step you can take in designing an effective system. A security system for museum collections, for example, has two principal objectives: to protect museum collections and associated records from catastrophic loss, and to protect the documentation related to objects in the collection, such as accession records, catalog records, conservation reports, and photographs.
- No single subsystem or component can achieve a security system's overall objectives. Subsystems must complement each other to make the system efficient and ultimately successful.
- Subsystems and components are interdependent within a system. Changes in one part affect the whole system and may have unexpected consequences. For example, placing an air handler in a museum collection storage area might be an efficient use of space, but it complicates access control, adds a potential source of ignition, and increases the risk of accidental damage to museum objects.

2. *How should I design an effective security system?*

There are no cookbook solutions for security problems, and no single recipe will turn out a perfect security system every time. Each park must develop its own system. Every park is unique, faces different threats, has different short-term objectives, and has different resources available. While security concepts are mostly common sense, applying them effectively requires care, consideration, and experience.

One way you might think about a comprehensive security system is to visualize a series of concentric circles that form a bullseye (see Figure 9.1). Simply stated, you should add more and tighter security precautions as you get physically closer to a high value object, like the rings on the bullseye diagram. The more valuable the protected object, the more protection rings there should be, and the more they should focus on the object. The figure also shows the overlapping and

complementary roles played by park boundaries, policies, procedures, the building shell, cases, electronic systems, and personnel.

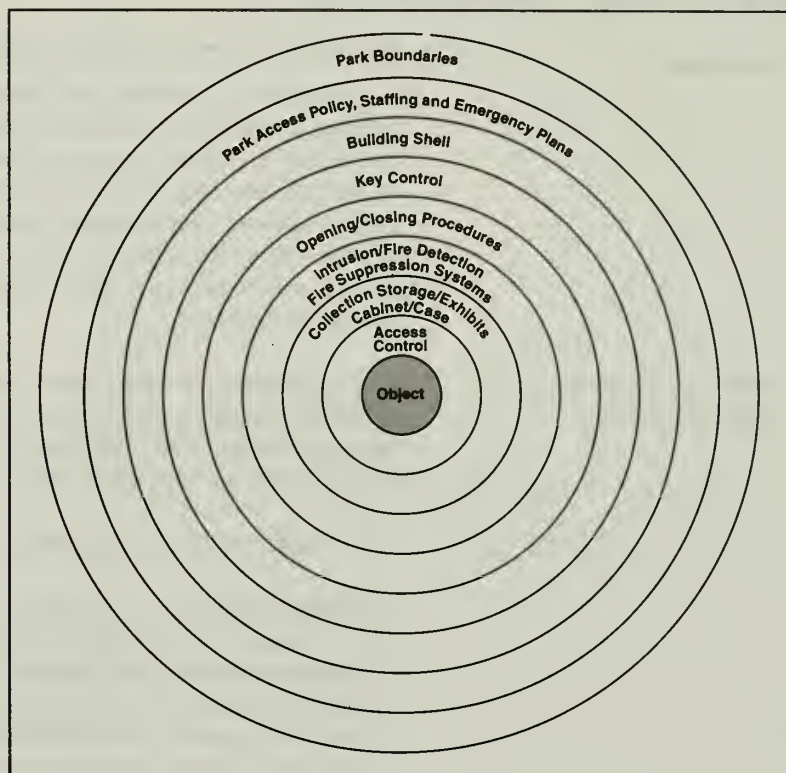


Figure 9.1. Security Bullseye

3. *Who is responsible for security?*

Overall responsibility for protecting the park's museum collection rests with the superintendent, while museum and law enforcement staff share direct day-to-day responsibility. Nevertheless, you and all of your fellow park employees--permanent, seasonal, salaried or volunteer--are part of the park's security system and have security responsibilities that should be reflected in the park's standard operating procedures (SOPs).

4. *What information will I find in this chapter?*

Information in this chapter will help you:

- identify threats to your collections
- assess the risk of loss
- select and implement appropriate countermeasures
- measure the effectiveness of those countermeasures

See NPS Museum Handbook, Part I, Appendix G, Protection of National Park Service Museum Collections, for NPS security and fire protection standards, glossary of terms, and sample statements of work, standard operating procedures, and agreements.

B. Legal, Regulatory and Policy Requirements

Protecting of museum collections is basic to the mission of the National Park Service. The following digest of statutes and policies provides a starting point for a park's protection program. In essence, they require you to use the most effective means available to protect museum collections against fire, theft, and other threats without compromising their integrity.

1. *What laws and regulations do I need to know?*

Title 40 United States Code (USC), Public Buildings, Property, and Works Paragraph 486(c) provides statutory authority for the head of each executive agency to issue orders and directives necessary to manage the Government's property.

Code of Federal Regulations (CFR) 41 Federal Property Management Regulations Part 101, Subpart 20.5 "Physical Protection", prescribes policies and methods for physically protecting buildings and grounds operated by GSA and other Federal Executive agencies. The Department of the Interior's property management regulations are in Part 114 of CFR 41.

2. *Which parts of the Department of the Interior's Manual address protecting museum collections?*

Part 411, Chapters 1-3, sets standards and requirements for protecting museum property.

Part 444, Chapter 1, tells you how to safeguard personnel, prevent unauthorized access to Federal property and records, and safeguard against espionage, sabotage, vandalism, and theft.

3. *Which NPS Management Policies address protecting museum collections?*

Chapter 5, Cultural Resource Management, outlines:

- **Security and Protective Measures** [p. 5:13]: "The National Park Service will employ the most effective concepts, techniques, and equipment to protect cultural resources against theft, fire, vandalism, environmental impacts, and other threats without compromising their integrity or unduly limiting their appreciation by the public."
- **Fire Detection and Suppression** [p. 5:13-14]: "Measures to protect cultural resources from fire will be developed as part of a park's fire management planning process, and prudent action will be taken to prevent harm to cultural resources by either fire or fire-suppression activities."

Chapter 8, Use of the Parks, discusses:

- **Visitor Safety and Protection** [pp. 8:5-6]: "...The National Park Service will strive to identify recognizable threats to the safety and health of persons and to the protection of property, by applying nationally accepted codes, standards, engineering principles, and the requirements of the Loss Control Management Program Guideline (NPS-50)...."

- *Law Enforcement* [p. 8:6]: "The National Park Service will make reasonable efforts to provide for the protection, safety, and security of park visitors, employees, concessionaires and public and private property and to protect the natural and cultural resources entrusted to its care."

Chapter 9, Park Facilities, requires:

Structural Fire Protection and Suppression [p. 9:7]: "Structural fires will be suppressed by appropriate community or county fire departments in accordance with the terms of agreements or contracting documents. At parks where such services are not available, the National Park Service will provide a level of structural fire protection commensurate with park needs.

Each superintendent will complete a structural fire needs assessment and develop and implement a structural fire plan...."

4. Which NPS special directives address protecting museum collections?

Special Directive 80-1, "Guidance for Meeting NPS Preservation and Protection Standards for Museum Collections" (Mar 90) establishes basic standards for museum security and fire protection and requires a self-assessment of museum security and fire protection programs every four years.

5. Which NPS guidelines address protecting museum collections?

Several NPS Guidelines contain instructions that you should consider in protecting museum collections.

NPS-9, Law Enforcement Policy and Guideline, vests considerable authority and responsibility in law enforcement staff for protecting park resources, including museum collections. It tells you to inventory your resources and prioritize protection needs after you assess their significance and vulnerability. It also discusses crime prevention and physical security programs in parks.

NPS-28, Cultural Resources Management Guideline, addresses protecting and managing all cultural resources, including museum objects.

- *Chapter 4* provides overall guidance on protecting cultural resources. The sections on physical security and structural fire relate to protecting museum objects.
- *Chapter 9* says a systematic approach to protecting museum objects involves:
 - identifying and evaluating threats and risks
 - conducting and reconciling annual inventories of collections
 - developing and implementing good operational procedures and practices, such as key control, access control, opening and closing procedures

- evaluating the physical security of spaces housing collections, with attention to barriers, cases, locks, doors, and windows
- installing intrusion detection systems and fire detection and suppression systems that are appropriate to the nature of collections and the structures housing them
- incorporating the special needs of collections in physical security plans, structural fire plans, and emergency operations plans
- ensuring that all incidents involving collections are reported

NPS-44, Personal Property Management Guideline, Chapter 9 governs firearms and ammunition that are part of a museum collection.

NPS-50, Loss Control Management Guideline, discusses employee safety and health programs, including inspection and maintenance of "fire detection and suppression systems; test and inspection reports for the fire protection systems and equipment; manufacturer's operating instructions for installed fire systems; and plans and reports for corrective actions taken. It also states that reviewers must evaluate designs for renovation of existing and historic buildings and for new construction, for several fire safety objectives including loss of life, structure, contents, operations, and historic integrity.

NPS-58, Structural Fire Guideline, tells you how to manage a structural fire program. It directs parks to place the major emphasis on identifying fire hazards, fire prevention, early detection, warning occupants, and plans and drills for rapid evacuation. *Chapter 13* states:

- Compliance with fire codes will not be allowed to destroy or impair the integrity of a structure, and when it is impossible to meet codes without significant alteration of fabric or architectural integrity, the use and operating procedures for the structure will be modified to limit the potential hazards.
- Where the significance or value of a historic structure or its contents warrant, adequate fire detection, warning and suppression systems shall be installed and monitored day and night by a central alarm station--park staff, a commercial central station alarm service, or a local fire department.
- When planning and installing detection or suppression systems, you must respect the integrity of the structure, the nature of museum objects, and the requirements of interpretation; use equipment that complies with the standards of the National Fire Protection Association (NFPA) and Underwriters Laboratories (UL Listed); and minimize physical and visual intrusions.
- All designated park structural fire personnel, including contractor and cooperator structural fire personnel, must be trained to protect structures and museum collections, and to evacuate and protect visitors.

- Smoking is prohibited in historic structures other than those adapted for residential, office, or modern functional uses. Smoking is not permitted in spaces housing museum collections. Where smoking is permitted, operational safety procedures and equipment must be appropriate to the risk.

C. Measuring the effectiveness of a security system

Past experience is an important element. Complete and accurate loss records, such as Case Incident Reports, are vital. Nevertheless, past history does not tell the whole story. You also must:

- analyze the risk comprehensively
- evaluate the effectiveness of the countermeasures intended to reduce the risk
- determine how well the security system fits the operational needs of your park

All the elements are important. And remember, a system that reduces risk but paralyzes operations is not effective.

1. *What are the threats to museum collections?*

Figure 9.2 lists the threats to museum collections.

General Category	Specific Threat
Crime	Burglary Robbery Vandalism Larceny Bombing Arson
Civil Disturbances and Warfare	
Natural Catastrophes	Earthquake Landslide Hurricane Tidal wave Volcanic eruption Flood Tornado Lightning Wildlife
Industrial Disasters	Explosion Structural collapse Hazardous materials release Fire Serious employee or visitor accident Nuclear incident Power outage Loss of water, sewer, or gas service
Other Threats	Accidental damage Acts by disturbed persons Transportation accidents

Figure 9.2. Threats to Museum Collections

2. *What is risk assessment?*

In assessing risk, you must analyze a threat's probability of occurrence and the severity of its consequences. You'll need to identify the possible ways losses can occur, what the impact of the losses would be, and how you prevent or reduce the losses.

Probability

While the number of potential threats is unlimited, some are more likely than others. In general, the more ways something can happen, the higher the probability it will happen. For example, consider a park with an extensive collection of Native American artifacts--pots, baskets, and other easily sold items. If the threat is theft, any of the following conditions, or some combination, increase the probability of a loss:

- Pots and archeological fragments on exhibit are not in locked exhibit cases.
- Objects on display are not routinely inventoried.
- There are no procedures for temporarily removing objects from exhibit cases.
- Exhibit cases have plain glass and standard fasteners.
- Exhibit spaces have large windows close to the ground.
- Door locks are not strong enough to prevent forcible entry.
- The building is not protected by an intrusion detection system.

Some threats are unlikely in some parks. For example, a park in New Mexico doesn't need to plan for a tidal wave. Some threats just seem unlikely. For example, a 500 year flood may seem to be a remote threat. But if we remember that the objective of the NPS preservation program is to preserve museum objects and historically significant structures for as long as possible, a 500 year flood is a threat that deserves thoughtful planning.

Severity

Highly probable threats may not require much in the way of preventive measures if the net loss or damage they would cause is small. On the other hand, moderately probable or greater threats demand greater attention if the impact would be great. For example, it is highly probable that someone will take the ball point pen from a visitor registration desk, but it is more cost-effective to use cheap pens, and replace them, than to prevent the loss. On the other hand, a low to moderate probability of arson in an historic structure demands full protective measures because the impact could be significant.

You can measure the impact of a loss by the direct cost, or dollar value, of the lost or damaged property and the cost of its repair or replacement. Direct cost is quantifiable and can be used to evaluate the cost-effectiveness of potential countermeasures. However, it may not be the most important measure, because the indirect costs may have a more severe impact on the park's mission. Indirect costs could include:

- effects on employee morale and reputations

- effects on public relations
- loss of donations to parks that do not protect their assets
- adverse impacts on the park's interpretive program

For example, a soldier's diary may have little dollar value, but it can play a significant part in telling the story of how the soldier lived and how soldiers in general took part in the development of the country. The diary serves both as an information resource and as a tangible point of reference to help visitors relate to the story. The fact that the diary is an original object enhances the relationship. If the diary is stolen, the interpretive story suffers in ways that cannot be translated into dollars.

3. *How do I conduct a risk assessment?*

First, you need to identify the potential threats or hazards that have the greatest probability of occurring and those with the greatest adverse impact on the museum collection.

Then look for irreplaceable, valuable and particularly sensitive objects, especially those on exhibit, such as historic firearms and paintings.

Finally, analyze the nature and effectiveness of the protection currently given such objects. For example, if you want to assess how well an object is protected from theft, try to think like a thief.

- A thief has to touch an object with something--hand, stick, wire hook, an accomplice--to steal it. Look at obvious ways first. In one theft from a park, the thief removed a diary from a case by tilting up the unsecured vitrine cover.
- If the case is small or poorly mounted, the thief might take both the case and the object in it. Look carefully at how cases are mounted. The case may be strong, but the wall mounting may be weak so the thief can pull the case off the wall, or remove it by taking out a few fasteners. So ask yourself:
 - Are doors and cases locked?
 - Are cases structurally sound?
 - Are fasteners firmly in place?
- After checking the obvious, be creative. A thief is not restricted by our concept of what someone might do, only by what it is possible to do. In one incident, a thief boosted a small child over a Plexiglas™ barrier that covered all but a small space at the top of a door into a period room. The child gathered objects and escaped through another door.

4. *How can I limit the risk?*

If possible, eliminate threats; if not, reduce them by:

- **Risk Assumption** is the process of using existing resources to absorb losses as and when they occur. It may be appropriate under the following conditions:

The impact of a loss is small. For example, it is advisable to assume the risk of some forms of vandalism.

The likelihood of damage is small. For example, it takes considerable effort to damage a stone grinding wheel. Even if the grinding wheel is original to the site it may not make sense to exhibit it in a case, or even in a building, when it is easier to see outside and the wheel's size and composition make it nearly indestructible.

- **Risk Transfer** is the process of transferring a risk to another entity for a fee. It is usually not appropriate because the NPS generally insures property only when it is borrowed from someone outside the government or another government agency.

See the Museum Handbook, Part II, (MH-II) Museum Records, Chapter 4, Inventory and Other Special Instructions for guidance on insuring borrowed objects.

5. *How often should I assess risk and what tools are available?*

Special Directive 80-1, "Guidance for Meeting NPS Preservation and Protection Standards for Museum Collections", requires a self-assessment of museum security and fire protection programs every four years. Special Directive 80-1 includes by reference the NPS Checklist for Preservation and Protection of Museum Collections. You can use the checklist to conduct the self-assessment. See MH-I, Appendix F, NPS Museum Collections Management Checklists, and the Automated National Catalog User Manual, Appendix O, Automated Checklist Program (ACP) User Guide for guidance on the checklist.

6. *How do I conduct a self-assessment?*

Conduct a **Basic Security Inspection** by using the checklist as a guide to inspect museum collection spaces. There are three steps in this inspection.

- Describe the nature of the museum collection, to include:
 - types of materials used, such as paper, wood, or stone
 - value of objects (for example, monetary, research, interpretation)
 - most significant objects in the collection (for example, letter signed by President Truman)

See the NPS Museum Handbook, Part I, (MH-I) Chapter 2, Scope of Museum Collections, for guidance in establishing value.

- Identify the areas where the collection is kept (such as visitor center exhibit, storage), especially the most valuable and most vulnerable objects.
- Inspect for deficiencies using the NPS Checklist for Preservation and Protection of Museum Collections.

7. *What is a security survey?*

Use a *security survey* in the on-site phase of preparing a Collection Management Plan or as a specific need in a self-assessment inspection. Do not forget to include fire protection.

A comprehensive security survey will cover:

- perimeter security
- structures housing the collection
- policies and procedures
- emergency plans
- individual object protection
- fire prevention
- personnel training programs
- structural and procedural fire hazards
- maintenance of protective systems

Either you or a contractor can conduct the survey. Whoever does so must have the following qualifications:

- experience and expertise in protecting museums and historic sites
- sensitivity to the special protection requirements in museum operations
- practical experience in applying the requirements in parks and historic sites

8. *How should I prepare for a survey?*

Write a detailed scope of work (SOW) that serves as a blueprint for the survey and as a standard against which to measure the surveyor's work. See *MH-I*, Appendix G, Protection of National Park Service Museum Collections, for a sample SOW. The scope of work should specify what the surveyor is expected to do, and when, and how to report results.

Make sure all facilities with museum collections will be available during the survey. Brief park staff on the importance of the survey and ask everyone to answer questions candidly.

Prepare the following documents for the surveyor:

- most recently-completed NPS Checklist for Preservation and Protection of Museum Collections
- reports from any earlier security surveys
- plans and drawings of all facilities that house museum collections on which the surveyor will record observations to be included with the final report

- information on installation, operation and maintenance of the existing intrusion, fire detection, and fire suppression systems

Schedule meetings with the superintendent and key security, fire protection, and museum staff at the beginning of the survey to discuss its scope and at the end to discuss findings and recommendations. Also, schedule blocks of time for key staff members to spend with the surveyor during the site visit.

9. *What should the survey report include?*

From the site visit, the surveyor will:

- identify potential threats
- perform a risk analysis
- determine which losses are most likely and which would have the greatest impact
- establish priorities for correcting deficiencies

The final report should include:

- recommended improvements
- countermeasures that correct more than one problem
- alternatives for correcting deficiencies
- estimated cost for each recommended action

10. *What is the final and most important step?*

The last and most important part of your security survey will be the corrective action plan you will develop and implement afterwards. Take corrective actions that do not require funds, such as changing operating policies or procedures, immediately. Changes that can be made at a small cost also should be made relatively soon, while changes that require significant funding must be programmed. See *MH-I*, Chapter 12, Curatorial Programming, Funding, and Staffing, for guidance on programming. Naturally, if money is available, the most serious deficiencies should be corrected first. If funding is a problem, many corrective actions can be implemented in stages, or you may want to use the funds that are available to correct several less severe risks. The combined improvement from correcting several small problems can often outweigh the effect of correcting one large one.

If you discovered weaknesses in your security system, your corrective action plan should have taken care of them. If on the other hand, your security system works, stick with it, make minor improvements on the margin, and continue to self-assess on a regular basis.

But what if you need a new security system, in whole or part? The sections that follow in this chapter will help you design effective fire protection and security systems.

D. Fire Protection

Fire can destroy a park's museum collection in a matter of minutes. While a stolen or damaged object might be recovered and stabilized, burned objects, and sometimes even those just exposed to smoke and heat, may be lost forever. Human error, arson, deteriorating electrical and mechanical systems, and congested storage areas are only a few of the conditions that can increase the threat of fire.

Museum management staff should take a hard look at the park's Structural Fire Plan to make sure it addresses the needs of the museum collections.

1. *Who is responsible for fire protection?*

Preventing fire is a fundamental responsibility for every member of the Park Service, and each employee is responsible for

- maintaining well-organized storage and work spaces
- storing all flammable materials in approved containers outside spaces housing museum collections
- keeping fire exit routes open and clear
- enforcing a no-smoking policy in museum spaces
- controlling ignition sources, such as fires in the fireplace of a historic structure
- practicing good housekeeping
- checking electrical and mechanical equipment for defective components, improper installation, and overloaded circuits
- correcting or reporting fire hazards

Managers have the following additional responsibilities:

- Training all employees in the elements of fire safety, fire prevention, and emergency response with emphasis on:
 - duties in the event of fire or other emergency
 - how to notify the fire department and other emergency response personnel
 - procedures for evacuating of visitors and employees
 - special considerations for protecting museum collections
 - location and use of fire extinguishers, fire detection equipment, and fire suppression systems, including the location of sprinkler control valves and how they operate
- Consulting with the local fire department and acquainting fire-fighting personnel with the museum collection and its special needs.

- Being aware of the major causes of fires in parks and museums, as listed below in Figure 9:3.

Major Cause	Average Fires/Year
Electrical Distribution System	20
Incendiary or Suspicious Causes	16
Open Flame	10
Heating Equipment	9
Other Equipment	9
Unknown	8
Smoking Material (e.g., cigarette)	7
Exposure (to other hostile fire)	4
Appliance, Tool, or Air Conditioning	4
Natural Causes (lightning, etc.)	3
Cooking Equipment	3
Other Heat Source	1
Child Playing	< 1
Total	95

Figure 9.3. Major Causes of Museum Fires¹

2. *What are the precautions for construction and renovation?*

The National Fire Protection Association (NFPA) Technical Committee on Protection of Cultural Resources says: "It is during periods of reconstruction that extreme fire hazards exist and museums are most vulnerable to fire...."²

These are only a few of the fire hazards associated with construction and renovation:

- spontaneous ignition of rags used for painting, cleaning and polishing
- careless smoking
- torches and other open flames
- escaping flammable gas
- improper storage and use of flammable and combustible liquids
- poor housekeeping

You must be vigilant during periods of construction and renovation to maintain high standards of housekeeping and to control potential ignition sources.

3. *What about open flames in structures?*

You need to recognize the increased number of fire emergencies due to open flames, such as campfires, candles, lanterns, fire places and stoves that are popular elements in living history programs. You should ensure that the park has written procedures that include:

- Open flames will never be left unattended.

- At the end of the day an appropriate screen will be placed across the opening of any fireplace where there has been a fire that day.
- An appropriate fire extinguisher will be within easy reach when open flames are used inside a building.
- Staff will be trained to use open flame devices properly.
- Fires are not permitted in fireplaces or stoves with unlined chimneys.
- Active chimneys will be inspected and swept annually.

4. *What's the threat from fires?*

When a fire starts, the temperature in the room of origin can be lethal in two to three minutes, and everything combustible in the room can ignite in as little as four to five minutes. If the fire continues to build for another ten to fifteen minutes, chances are the structure will suffer significant damage.

Even a quickly extinguished fire will damage fragile objects. By the time the fire department starts manual suppression, museum objects close to the room of the fire's origin will be damaged or destroyed unless there is an automatic suppression system. When fire fighters start manual suppression, they will pump water on the fire through two or more hoses, each delivering 125 - 250 gallons per minute. But even a well-trained fire department located close to a burning structure requires more than 10 minutes to:

- receive the alarm
- travel to the site
- set-up equipment
- search for occupants
- find the origin of the fire
- begin manual suppression

5. *What should a structural fire plan cover?*

You need to ensure that your park's Structural Fire Plan includes protecting museum collections. The overall plan should address preventing, detecting, and suppressing fire throughout the park. The section of the plan that deals specifically with museum collections should also include the following:

- a memorandum of agreement with the local fire department calling for mutual cooperation in preparing a pre-fire plan for each structure

Curatorial staff should be involved in planning and have input into developing fire department response and salvage plans. See MH-I, Appendix G, "Protection of National Park Service Museum Collections," for a sample memorandum of agreement.

- operating and maintaining any automatic suppression systems

- a list of personnel designated to respond to a fire involving museum objects and their specific responsibilities
- training all park staff in procedures to follow in the event of a fire to minimize damage to museum collections
- a plan to relocate important objects in the collection to a pre-designated secure location

6. *How do I limit fire risk?*

By preventing, detecting, and suppressing fire.

7. *What constitutes a good fire prevention program?*

Do these three things:

- **Prevent ignition:** The employee responsibilities listed above accomplish this. Unfortunately, people still make mistakes, and some things are always beyond our control. Between the two, fires will happen.
- **Prevent fire spread:** When a fire starts, prevent its spread by
 - limiting the amount of fuel available
 - confining the fire in a space with a limited amount of oxygen
 - activating an automatic fire suppression system

Barriers can limit the spread of fire, smoke, and other combustion products.

An enclosed stairway is an excellent example of a structural feature that serves both as a fire and a smoke barrier. Open stairways act as chimneys in a fire, drawing flame, smoke, and products of combustion from one floor to another. Well fitting doors on each floor can prevent the spread of fire and smoke, but all it takes to compromise the protection is a single chocked open door.

And more than one closed bedroom door has protected a sleeping person from the effects of smoke and carbon monoxide.

- **Prevent fire from reaching vulnerable objects:** If you've used properly designed storage containers, you can protect vulnerable objects or records from fire for a time. For example, a locking, insulated safe, filing cabinet, or vault designed to maintain an interior temperature of less than 350°F during a one-hour exposure to exterior temperatures of at least 1700°F can protect paper accession records. Similarly, a media box that will maintain an interior temperature of not more than 125°F during a one hour exposure to an exterior temperature of 1700°F can protect floppy disks or magnetic tapes, such as those used to back up the Automated National Catalog System (ANCS) data files.

8. *Is a fire detection system essential?*

Even with the best fire prevention program, you will still need a good fire detection system. Human error, natural conditions, and deterioration

of buildings and systems almost guarantee a fire at some point, and life safety concerns alone demand rapid detection in an occupied structure.

Consider the following factors to determine fire detection needs:

- significance or value of the collection
- construction of the building
- nature of the collections
- number of occupants and what they are doing
- time needed to evacuate
- likely speed of fire spread
- time it will take to start suppressing a fire
- types of fire detectors available

9. *Who should monitor a detection system?*

A fire detection system only provides information. Someone who can use the information to send help must monitor it constantly. If the park does not have the staff or equipment to do this, the system should be monitored by the local fire department (if they provide this service, and someone is always there) or by a commercial central station that is listed by Underwriter's Laboratory (UL).

Sometimes parks in remote areas do not have access to a UL-Listed central station. In these instances, an unlisted facility may be adequate. You should make sure that the unlisted facility has enough staff to monitor alarms constantly, uses reliable equipment, and provides training to its staff.

10. *Why should I contact the local fire service provider?*

There are several advantages to contacting the local fire service provider. These contacts should be initiated during normal business hours so that they will not have to occur under the pressure of emergency operations. The advantages include:

- learning the availability of expertise for fire prevention inspections and code enforcement
- providing company inspections (orienting and familiarizing each shift)
- identifying the key person and contacts
- training/drills (joint activities to include day/night operations; business open/business shut down; seasonal - summer/winter)
- pre-fire planning (focusing on floor plans, access, utility shut-off locations, and sensitive items/areas)

11. *What types of fire detectors are available?*

The types of fire detectors normally used to protect museum collections and historic structures are listed in Figure 9.4.

TYPE	BEST USE OF THE DEVICE	WHERE SHOULD IT BE LOCATED?	THINGS TO AVOID
Photoelectric Smoke Detector (Spot Type)	To detect slow, smoldering fires that generate large amounts of visible smoke	<ul style="list-style-type: none"> • On the ceiling or wall at least 6" from the junction of the ceiling and wall • In the path of air circulation where smoke will reach the detector 	<ul style="list-style-type: none"> • Locating detector directly in the path of air from an air supply or return grill • Hot (> 100°F) or very cold (< 32°F) spaces • Dead air spaces • Spaces where steam or smoke are expected-- boiler rooms • Within 8' of an active fireplace • Dusty areas • Outside <p>NOTE: New detectors have protective screens to keep out insects. Very small spiders can still get into these detectors and cause false alarms.</p>
Photoelectric Beam Smoke Detector (Line Type)	<ul style="list-style-type: none"> • Large open spaces (30'x30' or greater) with high ceilings (> 12') • Slow, smoldering fires 	<ul style="list-style-type: none"> • Large gallery spaces • Auditoriums 	<ul style="list-style-type: none"> • Mounting detectors low (generally below 8') if the beam is broken or partially blocked the detector goes into alarm • Same conditions as spot type photoelectric detector
Ionization Detector (Spot Type)	To detect fast, flaming fires that may not generate much visible smoke	Same as spot type photoelectric smoke detector	Same as photoelectric NOTE: Insects are not a problem with ionization detectors, but they are much more sensitive to steam or the fine products of combustion normally found in boiler rooms.
Air Sampling Smoke Detector	Areas where very early detection is vital--these detectors are intended to react before fire reaches the flaming stage	High value areas such as vaults, or sensitive areas such as computer facilities	Where candles, fireplaces, wood stoves, or any other open flame will be used regularly
Flame Detector	Same as air sampling detector--frequently used in explosion-detection systems	Where large concentrations of flammable or combustible gas or dust are found	Same as air sampling smoke detector
Heat Detector	Spaces where environmental conditions cause unwanted alarms from smoke detectors, or where conditions (heat, cold, humidity) will damage electronic devices.	Same as spot type photoelectric or ionization detector	Where life-safety is the major concern--sleeping quarters, etc.--Heat detectors are not approved for life-safety applications.

Figure 9.4. Types of Fire Detectors

12. *What about maintenance and testing?*

A fire detection system needs routine maintenance and testing to keep it operating as designed and expected.

- Dirty smoke detectors are the most frequent cause of unwanted alarms.
- The control panel can fail, or operate erratically, particularly in areas prone to lightning or unreliable electric power.
- Evacuation alarms may fail, or people may not be able to hear them everywhere in the building.
- Telephone lines may fail, and dialers fail regularly.

Test and maintain fire detection systems in accordance with the requirements of NFPA 72, *National Fire Alarm Code* (listed in section K).

13. *How important is fire suppression?*

A fire detection system is effective only if detection is followed by **suppression**, such as fire extinguishers, stand-pipe, response by fire fighting personnel, or an automatic sprinkler system.

14. *Are fire extinguishers enough?*

An employee with a fire extinguisher often is the first line of defense when a fire starts. But first:

- Evacuate the building.
- Notify the fire department by the fastest available means, such as telephone, manual fire alarm.
- Fight the fire.

Fire produces carbon monoxide and other toxic gases that affect judgement and coordination and are the major killers in fires. So, attempt to fight a fire only if you are in good physical condition, are trained and properly equipped.

15. *Who should know how to use a fire extinguisher?*

Every employee should know how to use the park's fire extinguishers and where they are located. Training also should include instruction on the proper types for the most likely kinds of fires. Fire extinguishers have a label with a letter (**A**, **B**, **C**, or some combination) that tells the user what class fire it is designed to extinguish. See NFPA 10, *Portable Fire Extinguishers*, for additional information.

16. *What is the most common type extinguisher?*

The **ABC** multi-purpose dry chemical extinguisher is the most common type in parks because it is safe for use on all fires except those involving combustible metal. Multi-purpose dry chemical extinguishers use a fine powder, similar to baking soda, to smother fire. Not all dry chemical extinguishers are multi-purpose. **Purple K** dry chemical extinguishers are designed for flammable liquid fires and may harm some objects.

Don't use Purple K dry chemical extinguishers in museum spaces.

17. *What about Halon extinguishers?*

Many parks, concerned about the residue from dry chemical extinguishers, installed Halon 1211 or 1301 extinguishers in museum collection spaces. Halon is an ozone-depleting substance. As of January 1, 1994, the United States, and the other signatories of the Montreal Protocol, in order to protect the earth's ozone layer, stopped manufacturing halon and added a heavy tax to new halon imported into the country. It has not been banned, and there is no immediate reason for parks to remove their halon extinguishers. Halon is still available and will be for some time. Still, in time halon will become hard to get, and it will be expensive. Prudence, as well as concern for the environment, suggests that you should replace halon extinguishers with other types (multi-purpose dry chemical or CO₂ extinguishers) as they are used or start to leak.

18. *What are the maintenance and testing requirements?*

Fire extinguishers should be checked monthly and must be inspected annually. See NFPA 10, *Portable Fire Extinguishers* (listed in section K) for maintenance and testing requirements.

19. *What about standpipe and hose systems?*

A standpipe hose in untrained hands is a liability, can increase the amount of fire and water damage, and may place the person using it at risk of serious injury or death. Only physically capable, properly equipped, and properly trained employees should use a standpipe hose to fight a fire.

20. *What about sprinkler systems?*

A standard sprinkler system operates when a sprinkler head reaches its design operating temperature and opens. One sprinkler head opens at a time delivering about 25 gallons of water per minute to the fire. Most fires in sprinklered structures are controlled with five or fewer sprinkler heads opening. There are four types:

- *Wet pipe systems* generally are not used in spaces where the temperature drops below 32°F. An experienced fire protection specialist should evaluate the conditions before the park decides to use one of them.
- *Dry pipe systems* are designed for use in spaces where the temperature does fall below 32°F. Some museums use dry pipe systems to protect storage and exhibit spaces because there normally is no water in the pipe.
- *Pre-action systems* may be installed in areas where freezing or mechanical damage to sprinkler heads or pipes is likely. The disadvantage of a pre-action system is that when the fire detection system fails, or is out of service, the sprinkler system can't operate automatically. Routine maintenance on a pre-action system also is more complex and time consuming than on other types of sprinkler systems.
- *Cycling systems* turn off when the fire is out. If it depends on the fire detection system, it also can't operate automatically when that system is out of service. Some cycling systems have a separate detection system to control the sprinklers. In either case, maintenance of the system is complex.

Before selecting a sprinkler system, a structure's construction, environmental conditions, space, nature of museum collection, and protection priorities need to be studied. Consult with a qualified fire safety professional before deciding which type of system best suits your needs.

21. *What about water damage and accidental discharges?*

When there is a fire in a sprinklered structure, only those sprinkler heads exposed to heat (usually between 165°- 225°F) open and discharge water individually to extinguish or control the fire, thereby limiting to some extent possible water damage.

Sprinklers with higher temperature elements are available for special applications, such as protecting foundries, food preparation areas, or other higher temperature environments.

Curators frequently ask about potential collections damage from an accidental sprinkler discharge. Nearly all documented accidental discharges happened because of:

- improper design
- improper maintenance
- human error

Maintenance and testing is a particularly important element in preventing accidental sprinkler discharges. NFPA 25, *Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*, lists and describes the requirements (see section K).

A sprinkler system also has to be monitored. When the fire is out, someone has to turn the system off and restore it to service.

One way to limit the amount of water a sprinkler system discharges after the fire is out, without installing a complex cycling system, is to use on-off, or controlled flow, sprinkler heads on a wet pipe system. Although they cost 5-10 times more than a standard sprinkler head, controlled flow heads may add only 5%-15% to the total cost of the system.

22. *What about other automatic suppression systems?*

Halon 1301 systems are still being used in some NPS suppression systems and portable extinguishers. Since the Montreal Protocol, however, the NPS's policy is not to install any new halon systems and to program for replacing existing systems.

The fire suppression industry is experimenting with Halon substitutes, and several have been approved. Ansel's *Inergen*™, Dupont's *FE 13*, and Great Lakes Chemical Corporation's *FM 200*™ are the most popular. However, they are not drop-in replacements. To use any substitute now available in an existing halon system, you must modify the pipes, agent storage tanks, or discharge heads.

Carbon dioxide systems extinguish fire by reducing the oxygen content of the space below the point that it will support combustion or life. Thus, people must evacuate before the gas discharges or they may suffocate. Carbon dioxide is best for suppressing surface fires in service, utility, or other unoccupied areas.

23. *What do I need to know about installing mobile compact shelving?*

As parks seek to make better use of existing space, more and more of them are installing mobile compact storage systems to store museum objects. These systems eliminate fixed aisles and can expand a room's storage capacity as much as 40%. Combustible objects, records, books, and manuscripts stored in compact shelving units increase the fuel load in the room: there is more to burn, it will burn longer, and it will burn hotter. There are considerable fire risks. Before installing such shelving:

- A qualified structural engineer should evaluate the floor load-bearing capacity of the space. If the space is above grade, assess the potential impact of a fire on the floors below and above.
- A qualified fire protection specialist should evaluate the adequacy and effectiveness of systems to detect and suppress fire considering the potential for a concentrated fire load.
- You should consider modifying opening and closing procedures to include leaving open space between mobile shelving units when the area is unoccupied.

Mobile compact shelving units in the fully closed position delay both detecting and suppressing fire inside the shelving module. Closed, the shelving modules hold smoke and heat inside and can prevent water from reaching the fire to extinguish it. In a study conducted for the General Services Administration (GSA), and in later studies conducted for the National Archives and Records Administration (NARA) and for the National Library of Canada, tests showed that a fire can burn inside a closed shelving module for an hour and a half, or more, before activating ceiling mounted smoke detectors. Sprinkler operation is delayed, as well. The NARA and Canadian studies found that when compact storage modules are completely closed, severe fire damage will occur in more than one shelving module, even when fire detection and automatic suppression systems operate as designed.

Both tests showed that a small open space between shelving units reduces fire damage. NARA uses a computer-controlled system in Archives II to leave a 9" opening between the shelf units when the facility is closed or when the fire detection system activates. The Canadians use rubber bumpers to keep an opening of 1½ - 2 inches between shelving units, and a sprinkler system that puts a large amount of water on the fire quickly. Both methods prevent the spread of fire to other shelving modules and limit damage to materials on the shelves where the fire starts.

24. *What about salvage after the fire?*

After a fire, successful salvage operations require immediate action as long as they do not hinder suppression operations or compromise life-safety.

- In a fire, the fire department is in the best position to protect museum collections from damage. Museum staff should discuss these issues with fire-fighting personnel when they are preparing, or up-dating pre-fire plans for the building. Fire-fighting personnel need to know about particularly important or vulnerable objects, and they need help establishing priorities, i.e., what should be protected first.
- The park's Emergency Operations Plan (EOP) should include the following information regarding salvage for the museum collection.
 - temporary storage for museum objects removed from the fire area
 - location of protective coverings, such as salvage covers, and how and under what circumstances they should be used
 - names and telephone numbers of contractors who can make temporary repairs, provide emergency supplies, or provide salvage services such as freeze-dry units and water extraction
 - how and where to purchase materials and supplies, how to pay for them, and how to move them
 - other sources of help (other parks, museums with similar collections that are close by, etc.)
 - instructions for placing security, fire detection and fire suppression systems back in service
 - procedures for the security, inventory and tracking of museum collections affected by the emergency
 - temporary measures to protect the collection and the structure until repairs are completed

25. *Where can I get help?*

- Consult your park or System Support Office (SSO) Structural Fire Coordinator. Specific technical assistance and information can be obtained from the following National Park Service offices:
 - Structural Fire Chief, NPS Fire Program Management Center, National Interagency Fire Center (NIFC), Boise, ID
 Telephone: 208-387-5222
 FAX: 208-387-5250
 - NPS Safety Engineer, Denver Service Center, Technical Expert Safety and Codes, Denver, CO
 Telephone: 303-969-2196
 FAX: 303-969-2743
 - NPS Risk Management Division, Washington, DC
 Telephone: 202-343-7016
 FAX: 202-523-3609

- The security or protection services departments in most large museums, such as the Smithsonian Institution, give advice and answer questions.
- Invite your local fire department to inspect spaces housing museum collections. Consult regional, county and State Fire Marshall's offices and Fire Prevention Bureaus for additional information and guidance on fire safety.
- You should obtain copies of the National Fire Protection Association's recommended practices. These documents contain useful information on fire prevention, detection, suppression, and safety self-inspection. See Section K for a list of these publications.

E. Operational Security

When designing a new security system, or redesigning your existing one, you will want to reduce or remove the risks you have identified. Then you can develop and implement your day-to-day operating procedures, as well as your emergency procedures. Finally, you will need to train the staff on the new or revised system.

1. *What are some of the design issues I should consider?*

The value of cooperation in security planning is never more apparent than in the design phase of a new project--a new exhibit, a new storage facility, or refurbishing and restoring an historic structure. Working together, curators, security specialists, architects, engineers, exhibit designers, historic preservation specialists, interpreters, maintenance personnel, and fire safety professionals often can resolve security issues before they become a problem. Before you start work, prepare a written list of minimum security standards to include:

- proximity of staff to the exhibit area
- tours--size, type (self-guided versus staff-guided) and tour route
- proximity of exhibit objects to the tour path
- features that limit public access to exhibits

The Architectural Barriers Act of 1968, Section 504, and the Americans with Disabilities Act of 1990 require museums to be as accessible as practicable, both architecturally and programmatically. The NPS has installed equipment to make structures accessible to the mobility-impaired. In some historic structures, for example, access equipment is located out of public view to minimize the visual intrusion, and disabled visitors are routed through otherwise closed spaces. In the rare instances where an alternative access route goes through exhibit spaces, the planning team must consider the impact on the security of exhibit objects and their vulnerability to accidental damage.

- security issues raised by making exhibits accessible for people with disabilities

- vulnerability of exhibit objects to theft, vandalism, touching and accidental damage

You should resolve these and any other security issues before the design is approved to avoid the need to make costly corrections later.

Be aware that technology is developing so fast in some areas (such as computers and detection systems) that it may make sense to select the technology as close as possible to completion of the project, provided this does not require significant changes in the structure.

Finally, document **all** decisions.

2. *What should I cover in our day-to-day operational policies and procedures?*

The need for these detailed, day-to-day policies and procedures is to control access to vulnerable objects, a key element in your security program. The key in protecting museum collections is to allow reasonable access without creating undue risk. How? By controlling legitimate access while preventing unauthorized or unnecessary access.

Security programs depend on trusted agents, such as our Park Service employees, but even so, one individual should not have the freedom to care for and account for museum collections without routine oversight by someone who understands the system well enough to spot discrepancies. Your access control policy must include inspection, oversight, and audit safeguards to reduce the risk.

3. *What should I include in an access policy?*

When writing an access policy, include the following elements:

- statement of purpose
- general access procedures
- general guidelines for employees, scholars, researchers, visitors, service vendors, emergency response personnel, and others who are eligible for access to the museum collections
- conditions that justify access
- superintendent's signature

See *MH-I*, Appendix G, Protection of National Park Service Museum Collections, and *MH-II*, Appendix D, Museum Archives and Manuscript Collections, for sample access policy and procedures.

4. *What else should I do regarding access?*

- Know the people who have access to the collection. The more access someone has, the more you should know about him or her.
- Look for other ways for the person to accomplish his or her objective without allowing access to original pieces.
- Specify how someone receives authorization for access to collections:
 - Who is authorized to grant access?

- How much access can they grant (i.e., escorted, unescorted)?
- What justifies granting access?
- When are escorts required?
- Keep access lists up-to-date and make sure they are used routinely.
- Specify minimum parcel control procedures:
 - Limit the size of parcels visitors are allowed to carry into collection areas (anything larger than 11" X 15" can be a problem).
 - Search parcels larger than 11" X 15" if they are taken into research or non-public areas by non-employee researchers.
 - Use property passes to identify personal property taken out of the building by employees.

5. *Why should I be concerned about key control?*

Barriers and locks are the most common tools used to accomplish the objectives of your access control policy. While keys are a symbol of trust, as well as a way of controlling access, the key as status symbol sometimes overrides the importance of the key as a tool for access control.

The fewer keys there are, the better.

- Keys multiply over time, particularly at the master and grand master levels. Unchecked, this quickly compromises the access control program.
- Good key control requires ongoing maintenance and cooperation by all staff.
- Lost or stolen keys to museum collection spaces, such as storage or exhibit cases, increase the risk of loss.
- Lack of accountability invites unauthorized possession and duplication of keys.

6. *How do I control keys?*

Ask your Superintendent to sign written procedures that:

- Designate one person as responsible for controlling keys, including issuing or transferring keys, having keys made and inventorying keys annually.
- Designate, by name, those authorized to have keys to museum collections storage spaces and exhibit cases.
- List the responsibilities that go along with having park keys:
 - safeguarding keys
 - reporting lost keys

- returning keys when they are no longer needed

- Require a signed and dated Receipt of Property Form, DI-105, or its equivalent, when keys are issued.

7. *What should I do to safeguard keys?*

First, decide where and how to store spare keys and operational keys that remain on-site; then, think about off-site concerns.

In an ideal world, no keys would leave the park, but this is almost never possible, therefore:

- Designate which keys employees can take off-site.
- Specify limitations on taking keys off-site (overnight versus a two week vacation).
- Restrict the number of keys that leave the park, and be sure that grand master keys never leave the park (if lost or stolen the whole key system is compromised).
- Place keys to museum exhibit cases and specimen storage cabinets in a key cabinet (located in museum storage, where possible) or some other appropriate locked container at the end of each day.
- Limit access to the curatorial key cabinet to the curatorial staff.
- Keep other keys in a key cabinet in a protected space that is convenient for opening and closing.
- Lock up any keys that are not in use.
- Store spare removable cylinder cores and core removal keys in a safe, preferably separate from key blanks.

8. *What about access to keys in emergencies?*

Specify in your key control policy who may obtain keys in an emergency, how to get them, and where they are kept.

9. *How do I ensure accountability?*

- Develop audit and inventory procedures.
- Report results of the inventory to the Superintendent.
- Review key control records annually to make sure they are current.
- Make sure all museum keys are returned by transferring museum employees.

10. *What should I do if a key is lost or stolen?*

When a key is lost or stolen, the only sure way you can protect the facility is to rekey every lock it opens. If the missing key is a master, or grand master, then you should rekey all the locks.

11. *Are combination locks better than keyed locks?*

Combination locks have many applications. File cabinets and secure areas used by a large number of employees often have combination locks. The gate to a vehicle storage area is an example. Other applications include very high security areas, such as safes and vaults,

where the physical existence of the key poses a threat because of its vulnerability to loss, theft, or unauthorized use.

Combination locks have advantages and drawbacks. For example, while it is easier and less costly to change a combination than to rekey a lock, these locks can also be greater security risks. Why? Because many find it difficult to remember random number combinations. They:

- write down the combination (a quick look around a safe or file cabinet often turns up the combination written on something close by),
- use number combinations that are easy to defeat, or
- use birth dates or other number combinations easily associated with the safe's custodian.

Because of such security concerns, be sure that you change combinations annually, or when anyone with the combination transfers or quits, or whenever evidence suggests the combination has been compromised.

Also, you will want to seal a written record of the combination in an envelope designed to show evidence of tampering and keep it in another safe. Finally, do not forget to protect change keys/wrenches and the instructions for changing combinations from unauthorized use.

12. *What should I include in opening and closing procedures?*

The best access and key control programs in the world are of no value if you do not open or close the facility properly. Written opening and closing procedures provide a checklist for transitioning from one condition to the other and, at a minimum should:

- Identify who may open or close.

If you designate who has authority to open a building or controlled area, you establish both the responsibility and the authority to control access.

- Specify locking and unlocking sequences and paths.

There should be a clearly defined entry and exit procedure. The person opening the building should enter at a designated point, and the person closing the building should leave the same way.

- Require checking for stay-behinds.

Don't forget to inspect the building for someone trying to stay behind after closing.

- Buildings often have places someone can hide (closets, stairways), so the first step to prevent a stay-behind is to keep potential hiding places locked while visitors are in the building.
- For potential hiding places that cannot be locked, consider local daytime intrusion detectors to alert staff when someone enters them.

- When closing the building it is important to search it in a systematic way--start at the top, work down and out.
- Where possible, lock areas of the building as they are inspected to prevent someone moving back into a space after it is inspected.
- Written procedures should highlight vulnerable areas for special attention.
- It may be possible in a large building to activate the intrusion detection system by areas to detect someone trying to get back into an inspected area.

See *MH-I*, Appendix G, Protection of National Park Service Museum Collections, for sample opening and closing procedures.

13. *What else should I include in the opening and closing procedures?*

Opening and closing procedures should include:

- Alarm system information--include arming and disarming sequences.

Don't include alarm codes in the written procedures.

- Doors and windows to be opened and closed.
- Mechanical system information--how to activate and secure, systems that should be on when the building is open and off when it is closed, location of controls, and how to operate them.
- Potential fire hazards--locations of coffee pots, hot plates, and other heat producing devices (all of which should be turned off and unplugged at the end of the day).
- Opening procedures, such as the need to:
 - look for signs of unauthorized entry or theft
 - inventory particularly valuable or sensitive objects
 - check for unusual conditions (e.g., leaks in roof)
 - make sure all objects on exhibit are in place
 - make sure cases are locked
- Other site-specific conditions that require attention.

14. *What about the park's crime prevention and physical security plans?*

The park's crime prevention program should include:

- leadership and participation by management in developing and operating the security program
- regular security surveys by qualified personnel and provisions for corrective actions

- orientating and training all employees (permanent, temporary, seasonal, and volunteers) in security awareness, with emphasis on each employee's security responsibilities
- an appropriate level of security for all park property-- including museum collections, capital equipment, supplies, buildings, money, firearms, and historic sites, monuments, and ruins
- procedures for guides, reception desk personnel, and cashiers to surreptitiously summon help in an emergency or when a visitor becomes unruly
- an annual review of the park's crime and security problems followed by implementing preventive measures
- appointing of a full time or collateral duty Physical Security Coordinator

15. *What should I include in the Emergency Operations Plan?*

Be sure that protecting the museum collection is in the park's Emergency Operations Plan (EOP). See *MH-I*, Chapter 10, Emergency Planning for guidance on museum collections emergency planning. Staff should be trained to act promptly in an emergency and should be prepared to remove museum collections after seeing to the safety of visitors and other staff.

The Emergency Operation Plan should include specific information regarding:

- command and control
- controlling access in an emergency
- location of emergency keys
- inventory and location of emergency supplies
- location and operating instructions for fire extinguishers, fire alarm equipment and other fire suppression and emergency response equipment
- emergency telephone numbers for assistance--both on-site (curators, conservators) and off-site (System Support Office personnel, other cooperating agencies and institutions, commercial recovery firms, and emergency response personnel)

16. *What should I include in staff training?*

The final and most important element in your operational security program is staff training. Written policies and procedures are valuable only if all employees know what they are and how to implement them. Staff training should be specific and cover all basic security practices. Hold mandatory training sessions regularly.

Be sure to include these topics in the training:

- importance of routine security measures, such as locking doors and windows when the building is unattended
- importance of routine inventories of objects on exhibit and in storage
- reminder that theft is preventable
- reminder that most thefts are spontaneous events that occur because of simple oversights
- importance of maintaining the integrity of non-public spaces by challenging those who are not members of the staff when they are in these areas without an escort
- fire safety
- routine and emergency operations
- use and maintenance of equipment

17. *Where can I get help?*

- The security or protection services departments in most large museums, such as the Smithsonian Institution, give advice and answer specific questions.
- American Society for Industrial Security (ASIS) Standing Committee on Museum, Library, and Archive Security 1990 *Suggested Guidelines in Museum Security*, Arlington, Virginia. Members of the Standing Committee will give advice on specific problems. Call the ASIS Headquarters (703-522-5800).

F. Physical Security

While the previous section of this chapter discussed the concept of designing for security, this section examines the specific physical security elements you can use to satisfy your security standards. You can also incorporate these elements into existing facilities to help remove or reduce threats.

1. *What is physical security?*

Physical security includes all measures intended to prevent acts of violence against persons and destructive or unauthorized access to or removal of property. Physical security elements deny, delay, or discourage criminal acts, and are the means for achieving the objectives of the access control policy.

Physical security is a **crime prevention** tool. Three factors have to be present for a crime to occur:

$\text{MEANS} + \text{MOTIVE} + \text{OPPORTUNITY} = \text{CRIME}$
--

The criminal brings **MEANS** and **MOTIVE** to the crime. There is little we can do to remove them from the equation. We can use physical security measures, however, to remove or limit **OPPORTUNITY**.

2. *What are the tools of physical security?*

There are many, but the primary ones are:

- barriers
- locks
- lights

3. *Why do I need barriers?*

Barriers limit access by delaying the intruder, by making the intruder visible, or both. Given enough time a determined person can breach the most elaborate barrier, but you can discourage entry by increasing the time it takes and the chances of being seen, and by encouraging the thief to look for an easier target elsewhere.

Typical barriers might include:

- Park boundaries
 - natural barriers (e.g., ravines, mountains, water)
 - fences
 - well lighted open spaces
- Building structure
 - walls
 - foundations
 - roof
 - doors
 - windows
- Interior barriers
 - storage rooms
 - cabinets
 - vaults and safes
 - cases
 - temporary or permanent exhibit barriers

4. *How many barriers are enough?*

Figure 9.1 illustrates how you can use barriers to protect valuable objects:

- Add barriers, like the rings of the bullseye, to protect high value objects.

- The more valuable the object, the more rings you need.
- There have to be enough barriers to delay entry until the responder arrives.

5. *Why do I need locks?*

Properly designed and installed locks are one of the first lines of defense in a museum protection program. The locking system should not rely on

- warded locks
- spring latches
- deadbolts less than $\frac{3}{4}$ " long
- key-in-knob locks
- locks installed with screws $\frac{1}{2}$ " or less in length

A lock is no better than the door it is on or the strike and jam the bolt fits into, and even the best quality lock is of little value without an active key control program.

Most historic structures have old style locks on exterior doors. Authenticity considerations do not allow changing to modern locks in most cases. Where this is true, the park should include additional protection features, such as alarms, to supplement the locks.

6. *What criteria should I use in selecting locks?*

An effective locking system must fit the needs of the park and of the space it protects. Many types of locks are available, but they are not all equally effective in all circumstances. Isolated spaces and high security areas need heavy duty locks.

7. *What is required for museum storage spaces?*

Museum storage spaces should have metal or solid-core wood doors. Each door should have:

- a dead bolt lock
 - 1" or longer bolt
 - exclusive non-mastered key code
- hinges located with pins are on the secured side of the door (When this is not possible, spot-weld the hinge pins so they cannot be removed, or replace the existing hinges with hinges that have non-removable pins.)

You may want to use a proprietary or regionally propriety keyway--a lock system with a keyway the manufacturer guarantees not to sell to anyone else within a specified area. Keys for a proprietary keyway must be made by the manufacturer, or the park must purchase specialized key cutting equipment. The advantage is that the local hardware store cannot duplicate the park's keys.

8. *Why is an effective lighting system important?*
- Good lighting makes criminals nervous because it increases the chances of detection and identification. It has the opposite effect on employees and the public. Light increases the public's perception of the safety of an area and lets law enforcement patrols see what's going on and detect the physical signs of a break-in.
- It is not the intensity of the lighting as much as the evenness of the illumination that makes a lighting system effective. The area should be free of glare and shadows. Lights close to structures should illuminate toward the structure, not out and away from the structure. A properly designed lighting system eliminates hiding places and facilitates the ability of security patrols to observe.
9. *Is lighting always necessary?*
- Under some conditions lighting may attract unwanted attention to the site. In isolated rural areas, for example, a well-lighted building in an otherwise dark landscape makes an attractive target. Some parks have found that lighting remote parking lots also can bring unwanted visitors, making the lots a local hangout. In both cases, you may want to use time-clocks so the grounds or parking lots are lighted when legitimate visitors are using them, but dark afterward.
10. *What about light for closed circuit television (CCTV)?*
- Exhibit areas and visitor centers may use closed circuit television (CCTV) as a protection and control tool. A video recorder makes CCTV useful for after-hours protection by visually documenting unusual conditions. CCTV is also useful to those responding to intrusion or fire alarms. The cameras provide a quick way to survey a large building.
- If exhibit objects could be damaged by light, cameras are available that need little background illumination. Infrared illuminators also are available to boost the efficiency of CCTV cameras where visible light levels must remain low.
- Where CCTV is part of the protection system, after-hours lighting is an important consideration.
- Motion detectors can turn on lights and the VCR.
 - In a large building, you may want to have central light controls, so specific areas, or the whole building, can be illuminated at once. Low voltage remote control switches are well suited to that purpose.
11. *What is the value of human presence?*
- A human presence or response is a critical element in any physical security system. The mere presence of a person on the site is a deterrent. Of more importance, however, is a prompt response by a trained person when an attempt is made to breach the physical security of the site.
12. *Where can I get help?*
- NPS Law Enforcement and Physical Security Specialists
 - The security or protection services departments in most large museums, such as the Smithsonian Institution, give advice and answer specific questions.

- American Society for Industrial Security (ASIS) Standing Committee on Museum, Library, and Archive Security 1990 *Suggested Guidelines in Museum Security*, Arlington, Virginia. Members of the Standing Committee will give advice on specific problems. Call the ASIS Headquarters (703-522-5800).
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G. Electronic Security Systems

Electronic systems (e.g., CCTV, alarm systems) are only extensions of staff eyes and ears; they only provide information. There are four important questions you should answer before selecting an electronic security system to protect museum collections.

- What is the threat?
- How vulnerable is the collection?
- Are there restrictions on the installation?
- What should the system do?

1. *What is the threat?*

Learn as much past history as possible about thefts, acts of vandalism, accidental damage, and wear and tear on furnishings.

2. *How vulnerable is the collection?*

Go through room by room and identify museum objects that are vulnerable to theft, accidental damage, and wear and tear from visitor touching (whether purposeful or inadvertent).

3. *Are there restrictions on the installation?*

With the range of technology available, devices in period rooms do not have to be intrusive. Some security specialists argue that making detectors visible acts as a deterrent. Others make the case that visible detectors give away valuable information a thief can use to defeat the system and allow the potential burglar to spot weak points. Management has to make the final decision based on the level of the threat, the value and vulnerability of the collection, and the interpretive objectives. There is no completely right or wrong answer.

If you do use visible detectors, there are several things that can be done to minimize the information the potential thief can get while walking through the building.

- Mix visible and hidden devices. Visible detectors signal the would-be thief that there is a protection system, while the hidden devices provide back-up if the thief tries to exploit perceived weaknesses.

- Many parks leave the walk-test lights active on motion detectors. These lights are there so the installer can test the detector and measure the area it covers. Active walk-test lights give the same information to a would-be intruder. There are two schools of thought on how you might protect a space with motion detectors: position detectors to cover areas the intruder most likely will cross (creating traps), or install enough detectors so the intruder cannot move more than 6" undetected anywhere in the space.

As an added deterrent, you can also leave walk-test lights active where there is 100% saturation coverage, although such coverage is expensive and more intrusive in a period room. Designers usually specify saturation coverage for vaults and other highly protected spaces.

Where detectors create traps, the walk-test lights should be disabled. On most detectors this involves changing a switch or jumper wire inside the detector. Follow the instructions that accompany the detector. If all else fails, a piece of tape covering the light serves the same purpose.

- Damage to historic fabric
 - Be sensitive in placing security devices so as to prevent unnecessary damage and ensure that necessary damage is repairable.
 - Be aware of vertical and horizontal spaces where installers can run alarm wire.
 - Know if other work is planned that will open walls or ceilings. This may help with the placement of detectors.
 - Where physical or aesthetic considerations limit the ability to run wire, consider using wireless alarm devices so you don't have to penetrate surfaces. A combination of hard-wired and wireless devices may be optimum in many historic buildings.
- Placement of furnishings
 - The location of furniture in a room greatly influences the type and location of detectors that will be appropriate. Furniture can block a detector, making it ineffective, or, used properly, furniture can help disguise a well-placed detector.

4. *What should the system do?*

- If you install a **daytime alarm system**, is it more important to deter the act or catch the person who commits the act? If deterrence is preferred--as it normally should be--the design will include audible and visual indications that the act has triggered an alarm. If apprehension is preferred, audible and visual alarms may defeat the purpose.
- A **nighttime alarm system** has both deterrent and apprehension objectives. First, decide if a silent alarm, that summons law enforcement personnel, or a noisy one, that both summons law

enforcement personnel and draws attention to the site, is the most effective.

A silent intrusion detection system is more likely to lead to catching the intruder. And, in a populated area, an intrusion detection system sounding a loud horn or turning on lights may scare the intruder away empty handed. The determining factor should be a reasonable estimate of how much time the intruder needs versus the length of time before someone notices the alarm and takes action to stop the theft. If it only takes a few minutes, then doing everything reasonable to prevent the loss must take precedence over apprehension.

- **Personal Protection Alarms** allow people working in the building the ability to summon help quickly and silently, especially where assault, robbery, or harassment is a threat. (The reception desk in an urban park headquarters building located in a high crime area is a good example.)

Personal protection alarm systems (duress or panic alarms) can use small push-button radio transmitters, worn either as a pendant around the neck or on a belt, for protection of staff members who must move around in the course of their work, or fixed position transmitters for personnel at fee collection or sales shop cash registers.

5. *What factors influence a system's design?*

- Know who the responders are, where they are located, and the resources they have.
- Know how long it will take the responders to get to the site at different times of the day. Many jurisdictions have more police on duty between 4:00 p.m. and midnight than other times, but they are busier during that period. Rural areas may have only one or two officers on duty, each covering many square miles of area.

Where response time is long, the security system must include both electronic and physical security elements to be effective. If it takes the first responder 15 minutes to get to the site after the alarm sounds, then, to prevent the thief from taking an object it must be physically impossible to remove it in less than 15 minutes:

- It must be large and heavy enough to delay removal.
- It must be located in a room or vault that will withstand a determined attack for more than 15 minutes.
- It must be in a case that can withstand attack until help arrives.
- It must be some combination of the above.

Otherwise, the alarm only indicates someone entered the building and something may be gone.

- Think about what the responders know about the site. Consider access to the site, familiarity with the physical layout, and the responder's general level of training.

- Decide what information is needed by thinking about what will be done with it. Electronic systems provide all kinds of information. The more complex the system, the more costly it is to maintain, and the more important it is to maintain it regularly. Just as you would not under design an electronic security system, do not over design it.
- Determine the system's operating parameters. Some objects on display may need 24-hour individual protection. Value, replaceability, sensitivity to controversy, ease of sale, and vulnerability to damage. Precious metals, gems, firearms, edged weapons, currency, coins, jewelry, original documents, rare books, and stamps are all candidates for 24 hour protection systems.
- Identify how you will need to change operations. You can determine which changes are necessary by considering these issues:
 - Electronic systems complicate access, even for authorized personnel.
 - Electronic systems create the need for additional staff training.
 - Someone has to manage the electronic system.
 - Those operating, managing and maintaining sophisticated electronic systems need different skills than those using less complicated systems. An electronic system may, in some cases, require more staff.
 - It is very expensive to contract out all routine maintenance and minor repairs. If no one in the maintenance division can take care of them, money must be programmed into the budget, or someone must be trained, or both.
- Consider the following park specific issues:
 - The schedule for opening and closing the structures when staff arrive and depart, and visitor hours.
 - The procedures and staffing needed for opening and closing the structure.
 - The number and location of people on duty at any given time governs the nature of the response to daytime alarms and influences where and how to display the alarms.
 - The visitor tour path and direction, the number of persons on a tour, and the number of staff with each tour group help determine daytime alarm needs.

When all visitors are in tour groups, closely monitored by staff at all times, there may be less reason to install sophisticated alarm devices. However, when visitors wander freely through a structure,

and there are not enough staff to provide surveillance, electronic protection for objects becomes more important.

- You need to know the parts of the structure that are off-limits to visitors. Define the nature and level of access control needed in those places, and identify who is allowed in and under what circumstances. Provide information about physical access control measures, such as locks, and indicate whether to incorporate card readers, numeric key pads, or other devices into the overall alarm system.
- Study the environment. Where the components will be installed determines which technology you select. For example, if the building is reinforced concrete, or has a large amount of metal in the structure (including, perhaps, metal foil backed wall paper) then a wireless system may be a poor choice. Ambient temperature, humidity, and dust levels also are important considerations.
- Consider not only who responds, but also who monitors your system. With CCTV, for example, experience shows that someone can watch a monitor for about 30 minutes before it starts to become part of the visual background. This suggests the person assigned to monitor the system should be rotated every half hour. If not, then the system must include additional devices to identify potential threats and attract the operator's attention, such as a video motion detector.
- Observe the physical characteristics of the exhibit. For example, in a museum gallery where many people are present, color CCTV displays make it easier to distinguish and describe an individual. Where the camera is located in a little-used hallway, however, less expensive black and white monitors are usually sufficient.

5. *What are the types of intrusion detection devices?*

There is no cookbook way to design an effective intrusion detection system. Each protection problem is different, and the design of the intrusion detection system must reflect this. If not, the system will not provide effective protection, or the nuisance alarm rate will destroy confidence in it. Figure 9.5 describes commonly used intrusion detectors, how they detect, where to put them and common sources of nuisance alarms.

Each detector has strengths and weaknesses so an intrusion detection system that relies on one type has all the weaknesses of the detector selected. For example, using only contacts to protect doors, windows, and cases makes the building vulnerable if the intruder breaks the glass in a window and enters through the hole without raising the sash. Glass-break or motion detectors complement and provide back-up for perimeter and case protection detectors.

TYPE	WHAT IT DETECTS	WHERE TO PUT IT	COMMON SOURCES OF NUISANCE ALARMS
Passive Infrared (PIR)	<ul style="list-style-type: none"> • Movement of an infrared heat source (in the range generated by the human body) 	<ul style="list-style-type: none"> • Best located so intruder's path of travel crosses the detection zone of the detector; least effective where intruder's path of travel is directly toward or away from the detector. • Aimed at a wall, floor or ceiling with a stable background temperature located within the design range of the detector. 	<ul style="list-style-type: none"> • Heat sources (radiant heaters, hot water pipes, heat supply grills, etc.) • Surfaces heated quickly by the sun (metal doors, large areas of glass, etc.) • Aimed into open space, no stable background within detector range (for example, aiming a detector with a 50' range into a space 75' wide). Hot air moving at the detector's outer range can cause alarms. • Temperature extremes (below 32°F or above 100°F). • Small animals, such as cats, dogs, raccoons, large rats. Birds generally are not a problem. • Large amounts of dust. • Large electric motors, air compressors, that cycle on and off.
Photoelectric Beam	<ul style="list-style-type: none"> • Movement of a solid object crossing the infrared light beam. 	<ul style="list-style-type: none"> • Large open spaces • Out-door applications • Period rooms or other locations where an unobtrusive detector is desirable. The transmitter and receiver can be disguised or mounted inside a wall or other structure, although the transmitter must have a clear path to the receiver. If not hidden or disguised the intruder can step over or go under the beam. 	<ul style="list-style-type: none"> • Birds or large insects. If used outside, set the beam far enough off the ground to let small animals cross the path, or the area must be fenced to keep them out. Stacked arrays or multiple beams can compensate for this. • Accumulations of dust although more sophisticated devices compensate for gradual changes caused by environmental conditions.
Microwave Motion Detection	<ul style="list-style-type: none"> • Changes in microwave frequency. The detector transmits and receives electromagnetic energy in the microwave range (radar). Microwaves leave the transmitter, bounce off the target back to the receiver. The detector operates on the doppler effect (the frequency of the microwave energy changes as a target gets closer to or further away from the detector). 	<ul style="list-style-type: none"> • Best located so intruder travels toward or away from the device. A target that stays exactly the same distance from the device, but moves laterally to it, may not be detected. • Can be mounted behind some solids (microwaves will penetrate 1" or more of wood. Useful where visual intrusion is a concern (place detector inside a piece of furniture, behind wainscoting, etc.) • Aimed at a solid structural feature (masonry wall, etc). 	<ul style="list-style-type: none"> • Two devices in the same room operating on the same frequency. (One detects energy radiating from the other, causing unwanted alarms. Not a problem if detectors operate on different frequencies.) • Detector aimed at an outside wall fronting on a busy street, or a thin wall with foot traffic close to the building. • Aimed at a window or glass door. (Glass is invisible to microwave.) • Aimed at objects that move under normal conditions (curtains in the path of an air supply or draft from a door or window, for example).

Figure 9.5. Types of Intrusion Detection Devices

TYPE	WHAT IT DETECTS	WHERE TO PUT IT	COMMON SOURCES OF NUISANCE ALARMS
Ultrasonic Motion Detection	<ul style="list-style-type: none"> Changes in high-frequency sound. Similar to microwave, except uses high frequency sound energy. 	<ul style="list-style-type: none"> Similar to microwave, but does not penetrate solids, including glass. 	<ul style="list-style-type: none"> Strong air movement. Aimed at object that moves under normal conditions. <p>Unwanted alarms make these devices unpopular except where used with another technology (PIR or microwave in dual technology devices). Stable when used inside vitrine cases (alarms if cover is removed or broken).</p>
Dual Technology Detectors	<ul style="list-style-type: none"> Detector combines two technologies (e.g., microwave and passive infrared or ultrasonic and passive infrared). Activation of both technologies needed for alarm. Fewer is unwanted alarms when used properly. 	<ul style="list-style-type: none"> Same general considerations as other motion detectors. 	<ul style="list-style-type: none"> Environmental conditions or installation that voids one of the detection technologies (see above).
Sonic Sensors	<ul style="list-style-type: none"> Sound in the frequency range associated with movement. 	<ul style="list-style-type: none"> Quiet locations such as inside a vault. 	<ul style="list-style-type: none"> Vibration, shock, and some ambient noise conditions.
Passive Audio Sensors	<ul style="list-style-type: none"> Any sound in the protected space. 	<ul style="list-style-type: none"> Quiet locations such as inside of a vault. 	<ul style="list-style-type: none"> Ambient noise.
Contact Switches	<ul style="list-style-type: none"> Opening or closing a mechanical switch--includes magnetic door and window contacts, plunger switches, and roller or ball switches. Magnetic contacts are in two parts: a magnet mounted on a movable surface and a switch mounted on a fixed surface. Moving the magnet away from the switch causes the device to go into alarm. Properly installed, they are stable with a low failure rate. 	<ul style="list-style-type: none"> Doors, windows, hatches, etc. Exhibit cases, object protection (e.g., plunger switch under a object to detect movement of the object.) If there is a large gap between the magnet and the contact switch (e.g., the door on an historic building is warped or fits loosely), a larger magnet may stabilize the alarm. If warping at the top and bottom of the door is extreme, install contacts near the latch. Mount magnetic contacts on top or bottom of door about 6" from the latch edge. Magnetic contacts mounted on the hinge edge of the door allow the door to open enough to enter without an alarm. Use roller or ball switches for this. 	<ul style="list-style-type: none"> Flimsy doors that rattle excessively in the wind Doors that shrink or swell excessively as weather and the seasons change Wide gaps between the magnet and the contact switch caused by settling of the building Overhead doors with excess up and down movement when locked.

Figure 9.5. Types of Intrusion Detection Devices (continued)

TYPE	WHAT IT DETECTS	WHERE TO PUT IT	COMMON SOURCES OF NUISANCE ALARMS
Capacitance Motion Detection	<ul style="list-style-type: none"> • The device generates a capacitance field 4-6" from the protected object. Detects any electrical conductor that enters the field. • Most sound a local alarm to let the person know he or she is too close. Used to prevent touching--alarm sounds before person touches the protected object. 	<ul style="list-style-type: none"> • Primarily used in museums to protect high value wall hangings or paintings from touching. • Must be used with physical barriers to prevent accidentally getting too close to the protected object. 	<ul style="list-style-type: none"> • Lack of physical barriers to prevent visitors from accidentally getting too close to the object. • Requires frequent adjustment, and is sensitive to humidity and moisture.
Pressure Mats	<ul style="list-style-type: none"> • Pressure 	<ul style="list-style-type: none"> • Usually placed under a rug or carpet to detect an intruder who steps into the protected space. • Period rooms with a rug or floor cloth. 	<ul style="list-style-type: none"> • Lack of barriers to prevent visitors from stepping into protected area accidentally.
Vibration or Shock Detection	<ul style="list-style-type: none"> • Vibration or shock 	<ul style="list-style-type: none"> • Attached directly to the protected object, an exhibit platform, or the structure of an exhibit case. 	<ul style="list-style-type: none"> • Vibration from a train, trucks or cars on a busy highway, or an air handler that cycles on and off. Some have adjustments to screen out ambient vibration.
Glass Break Detection	<ul style="list-style-type: none"> • Frequency Discriminators: A sound detector activated by frequencies generated by breaking glass. • Metallic Foil or Wire: A ribbon of lead foil or small wire that acts as an electrical path. Attaches in a pattern around the outside of a window glass. Breaking the glass breaks the electrical circuit to activate an alarm. 	<ul style="list-style-type: none"> • Frequency discriminators can be concealed near the protected glass. • Foil must be mounted directly to the protected glass (limiting its usefulness in historic houses with original glass). 	<ul style="list-style-type: none"> • Frequency Discriminators: Clicking sounds, such as the sound of a heel tap on a tile floor, air moving through supply and return grills in the HVAC system, pipes heating and cooling, and some equipment noises. • Foil: Accidental damage and damage from water, sun, and temperature changes.
Strain Sensors	<ul style="list-style-type: none"> • Detects elongation of the under side of a joist, floor, or platform that occurs when weight is applied to the top surface. 	<ul style="list-style-type: none"> • Underside of floors, stair treads, and other surfaces an intruder might walk over. • Under surfaces supporting high value objects to detect removal of the object. The sensor adjusts for weight normally on the surface. After it adjusts, the device alarms if the weight increases or decreases. 	<ul style="list-style-type: none"> • Large animals with access to the protected area.

Figure 9.5. Types of Intrusion Detection Devices (continued)

6. *What are the most common causes of a false alarm?*

There is no such thing as a false alarm. An electronic detection system alarms because something approximates the conditions that one or more of the components of the system are designed to detect.

- If a rat runs in front of a microwave detector, it should alarm. The rat's movement has all the qualities that the detector was designed to detect. The alarm may be unwanted and a nuisance, but it is not false. To stop unwanted alarms like this, either select another type of detector that will not register the movement of the rat, or get rid of the rats!
- Power-induced alarms are unwanted, but power fluctuations can mimic the conditions the system is designed to register. The fix for this problem is to clean up the power supply.

The primary cause is human error. Someone either forgets to turn the system off, turns it on or off incorrectly, or accidentally triggers the system in some other way. The solution is either educating the users better or simplifying the system. Poor system design and lack of maintenance are other causes.

7. *What can I do to reduce the number of false alarms?*

Think about the conditions the system is designed to detect and then look for those conditions or conditions that mimic them. Look for patterns in the alarm records. For example, protection staff at a park noted a passive infrared detector in a loading dock often went into alarm between 6:30 a.m. and 8:00 a.m. Examining the area showed the device was aimed at a metal roll-up door facing east. As the sun came up and heated the door, infrared radiation inside the loading dock put the device into alarm. Repositioning the device cured the problem.

8. *What are other design considerations?*

Electronic access control systems can stand alone, or they can be computer controlled. Some use cards, some use keypads, and some use both. Some can be integrated with a CCTV system. The advantages are:

- You can customize a person's access to a particular area at a particular time. High security areas can be programmed to require two authorized people before entry is granted.
- A lost card can be programmed out of the system and does not have to be recovered (unlike a lock system where a lost key requires extensive and expensive rekeying).
- The system can provide a record of who entered a space and when.

Closed circuit television (CCTV) systems can improve the efficiency of the protection staff. With CCTV one person can monitor multiple and remote locations. CCTV does not replace personnel, however; someone always has to respond to prevent losses.

Lighting is also an important consideration in the design of a CCTV system. See the discussion on lighting in Section F.

Electronic exhibit and case protection Systems require technical input from someone familiar with the design of exhibit and case protection

systems. Many of the detectors discussed in the tables at the end of this section are useful for protecting exhibits and cases. As with intrusion detection systems, there is no cookbook way to protect cases or exhibits.

Alarm response time is critical because exhibit and storage cases are the innermost rings of the bullseye. They directly house the objects we most need to protect. When the thief is inside the case or exhibit, the loss is imminent. At that point only the exhibit mounting stands between the thief and the object. If vandalism is the intent, the object will already be damaged.

Electronic system maintenance components are sensitive to heat, cold, dust, lightning, power fluctuations, power outages and mechanical damage, and must have regular routine maintenance to operate as designed.

System maintenance can be contracted out, although as a rule, standard maintenance agreements do not cover damage from electrical power problems, lightning, accidental or deliberate mechanical damage, or natural disasters. Repairs not covered by the maintenance agreement usually are made on a time and materials basis. The alternative is to train or hire in-house staff to maintain the systems.

9. *Where can I get help?*

- The security or protection services departments in most large museums, such as the Smithsonian Institution, give advice and answer specific questions.
- ASIS Standing Committee on Museum, Library, and Archive Security 1990 *Suggested Guidelines in Museum Security*. Arlington, Virginia. Members of the Standing Committee will give advice on specific problems. Call the ASIS Headquarters in Arlington, Virginia (703-522-5800).
- Barnard, Robert L. *Intrusion Detection Systems: Principles of Operation and Application* (Second Edition). Boston, MA: Butterworths, 1988.

H. Protecting Collections in Transit

Museum objects are at greatest risk when in transit from one place to another. Whether in the custody of a courier, a bonded mover, or the U.S. mail, the act of transporting objects exposes them to risks not encountered in the park. Deciding how to transport a museum object safely, how much protection to provide, and how much it will cost, demands a rigorous analysis of the risk. Consider the following issues before consigning museum objects to a mover.

1. *What are the object's characteristics?*

Consider the object's value (monetary, historic significance), its vulnerability to theft or damage, and its physical characteristics, that limit the appropriate means of transportation such as size, weight, and composition.

2. *What means of transportation should I select?*

Objects that are especially vulnerable to theft or damage or that have significant value should be carried by the most secure means possible. That may mean a courier, a contract carrier, or both.

The most significant threat to an object in transit is a transportation accident. Like a fire, an accident involving the transport vehicle can destroy everything in it. The prospective transporter's safety record should be a significant factor in selecting a carrier.

3. *How should objects be handled in transit?*

Discuss special handling considerations with the transporter. For example, mechanical lifting devices, such as fork lifts, should not be used for most categories of museum objects. Spell out these requirements to the transporter in advance.

4. *Is chain of custody important?*

Yes! A courier is the optimum way to handle chain of custody. However, except for very important objects, a courier may not be practical because of the cost. Nevertheless, it is vital to define how accountability transfers from one person or organization to another.

- Establish inventory procedures that do not require the objects to be unpacked when custody changes.
- When the objects are transported by a bonded mover, the contract should state that the driver will not leave the truck unattended for breaks, meals, or any other reasons.

5. *What about intermediate stops?*

Long distance movers often route objects from one place to another by way of central collection points, much as an airline routes passengers to one city via a hub in another. Intermediate loading and unloading of museum objects increases the risk of damage significantly.

If possible, museum objects should be moved directly from point A to point B with no intermediate unloading and reloading. If the values do not justify the cost of direct, non-stop routing, try to keep intermediate stops to a minimum.

If objects are placed into temporary storage along the way, the warehouse should be bonded, and the park should review the warehouse's security procedures.

6. *What about delivery time?*

When the objects reach their destination, someone should be on site to receive them. Specify in the contract that the mover will schedule the arrival of the van at a time when the receiving facility is open or staffed.

7. *Where can I get help?*

- The Registrar's Committee and the Security Committee of the American Association of Museums (AAM) provide specialized publications and referrals. Call the AAM in Washington, D.C. (202-289-1818) for a contact.

I. Reporting and Recovering Stolen Museum Objects

Time is critical after a theft because after only a few hours the likelihood of recovery for most museum objects is very small. Success depends on:

- detecting the loss quickly,
- notifying law enforcement agencies rapidly, and

- providing a detailed description of the objects and, if possible, a photograph.

1. *What should I do if I suspect a theft?*

Before calling the police, make sure that a staff member has not moved the object to another location within the park. If you cannot locate the missing object within a reasonable time, call the park law enforcement specialist and the police.

- Secure the area and do not permit anyone to enter.
- Determine exactly what is missing, but do not handle or move anything, or allow anyone else to do so. Consider everything in the area of the theft as potential evidence.
- Locate the following records:

Museum Catalog Record (Form 10-254) for each missing object. Make photocopies for use during the investigation.

A clear photograph of the missing objects.

- The park's law enforcement officer must complete a Case Incident Record (Form 10-343), with a copy of each relevant museum catalog record attached to the report.

See the NPS MH-II, Chapter 4, Inventory and Other Special Instructions, for guidance on reporting the loss of museum objects.

2. *How do I report a theft to outside agencies?*

Theft of museum objects and library, archival and manuscript materials is a serious international problem, and only 10 to 15 percent of stolen museum objects are recovered. This is because it is difficult to alert law enforcement agencies outside the area where the theft occurred about the theft. The problem is especially acute when the thief takes the stolen object over a state or international boundary, a common occurrence with stolen museum objects.

You should notify other appropriate agencies and offices as soon as possible after notifying local law enforcement authorities and the NPS law enforcement specialist. It is vital to report all losses, because the more widely a loss is reported, the better the chance of recovery.

Depending on your arrangements with the local police, they may be the conduit for reporting crimes to the Federal Bureau of Investigation (FBI) and to the International Police Organization (INTERPOL). See NPS *MH-II*, Chapter 4, Inventory and Other Special Instructions, Section III, for a list of agencies to which you can report a theft.

3. *How should I handle the news media after a theft?*

Dealing successfully with the news media can help limit the public relations impact of a theft.

- Detail **one** person as the media spokesperson and coordinate **all** communication with the news media through that person.
- Do not discuss details of the theft with the public, news media, or other employees.
- Do not speculate about what happened, what was stolen, or the value of the missing objects.
- Prepare a statement for the news media with general information about the incident, and release it as soon as practical.

J. Museum Collection Records

Museum records are as valuable as any object in the collection and should be just as well protected.

1. *Why are the records important?*

Records, catalogs, and photographs of the park's museum collection are vital for security of the collection. For example, stolen objects are more likely to be recovered if they have been cataloged and if a full description and even a photograph of the object is available for law enforcement agencies.

2. *When should I use the camera?*

Photographs are better for describing and identifying objects than written records.

- Photograph the museum collection, or at least the more valuable or sensitive objects.
- Photograph exhibits, both as a record of the exhibit and as a quick way to inventory objects on exhibit when opening and closing for the day. Consider keeping photographs in a three ring binder as a quick reference for interpreters. Some museums and historic sites keep catalog information about specific objects in the binder as well to help interpreters answer visitor questions about the history of the objects on exhibit. See the NPS *MH-II*, Chapter 3, Cataloging, for procedures on cataloging, and Appendix L, Photography, for guidance on photographing museum objects.

3. *Should I review my museum records protection program?*

Yes. Records are vulnerable to a wide range of threats--human error, fire, theft, mildew, mold, pests, paper deterioration, water damage, disasters and electronic media deterioration--and require constant attention.

- Keep duplicates of all museum property records in a secure location off-site. Avoid a location that will be affected by an area-wide natural disaster, such as an earthquake, that would affect both the park and the off-site location.
- Restrict access. Catalog and accession records should not be accessible to visitors, researchers, or non-museum employees except

under the close supervision of the curatorial staff. Theft of an object and its associated museum records makes it extremely difficult to trace the object or to prove its ownership.

- Check environmental conditions and make sure there is an active pest management program.
 - Keep records away from pipes and out of basements or flood plains. Use water or leak detection alarms where water damage is a potential threat.
 - Make sure records are included in disaster and recovery plans.
 - Train personnel in proper record maintenance techniques, and check work for accuracy.
 - Keep important records on high quality paper (high rag content with alkaline deterioration buffer).
 - Make sure electronic media are backed-up, stored properly, and access is controlled.
 - Store paper records in a locking, approved UL-Rated Class C or D, as appropriate) insulated filing cabinet.
4. *Where can I get help?*
- For detailed descriptions and applications guidelines, see the *CRM Bulletin Supplement* by John E. Hunter cited in Section K.
 - The park's fire safety officer, a local fire marshal or an NPS archivist or collection manager.
 - NPS *Tools of the Trade* for sources of approved insulated files.
 - The NPS *MH-II*, Chapter 2, Accessioning, for guidance on protecting museum records.

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L. Endnotes

1. NFPA 911: *Museums and Museum Collections*. Quincy, MA: National Fire Protection Association, 1991, p.6, Table 2-1, "Fire in Museums by Major Cause Annual Average of 1980-88 Structure Fires Reported to U.S. Fire Departments." The data in Figure 9.3 is based on updated information provided in 1994 by NFPA research staff.
2. NFPA 911: *Museums and Museum Collections*. Quincy, MA: National Fire Protection Association, 1991, Chapter 8 - Alterations and Renovations (8-1.1), page 16.

Appendix E: Scope of Collection Statement

	<u>Page</u>
A. Overview	E:1
What information will I find in this appendix?	E:1
Who can assist me in writing or revising my park's Scope of Collection Statement?	E:1
B. Evaluating Your Scope of Collection Statement	E:1
How do I evaluate a Scope of Collection Statement?	E:1
How do I use the checklist?	E:1
Where do I find the checklist?	E:2
C. List of Figures	E:2

APPENDIX E: SCOPE OF COLLECTION STATEMENT

A. Overview

1. *What information will I find in this appendix?*

You will find a checklist that can be used to review a draft or approved Scope of Collection Statement (SOCS). You also will find a sample completed SOCS.
2. *Who can assist me in writing or revising my park's Scope of Collection Statement?*

Contact your System Support Office (SSO) curator for examples of approved SOCS that show how different parks have written their statement. Figure E.1 includes, as an example, the approved Scope of Collection Statement for Mesa Verde National Park.

Obtain a 3½" diskette from your SSO curator to assist you in writing or revising your SOCS. The disk contains the required format and language for a SOCS. You can use this disk to fill in the wording that is pertinent to your park.

If you have questions about what types of collections to include in the Types of Collection Section, contact your park and SSO discipline specialists.

B. Evaluating Your Scope of Collection Statement

1. *How do I evaluate a Scope of Collection Statement?*

Use the checklist included in Figure E.2 to review a draft or approved SOCS.

See the NPS Museum Handbook, Part I (MH-I), Chapter 2, Scope of Museum Collections (1994), for guidance on writing a Scope of Collection Statement. Read this guidance before reviewing your SOCS.
2. *How do I use the checklist?*

To use the checklist:

 - Enter the unit's complete name. A unit is a park, center, or office with a museum collection. Place an "X" in either the draft or approved block. Enter the date (month, day, and year) of draft or approved document. Enter the name of reviewer and date reviewed.
 - Place a checkmark in the "YES" column to indicate that the required wording is in the SOCS, that the wording is accurate, and that it is in the appropriate section.
 - Place a checkmark in the "NO" column to indicate that the required statement does not appear in the SOCS.
 - Place an "X" in the "YES" column to indicate that there is a note explaining a partial deficiency either adjacent to the "X" response or in Section I of the checklist. Number each note included in Section I to correspond with the applicable checklist question.

- Place an N/A entered between the "YES" and "NO" columns to indicate that the question is not applicable to the SOCS.
- There may be times when the answer to a specific checklist question cannot be answered by the reviewer. If this is the case, print "ND" meaning "Not Determined" on the appropriate lines.

For certain statements, the specific reference for the *MH-I*, Chapter 2, Scope of Museum Collections (1994), is provided in brackets following the statement. For example, [*MH-I,2:8-9*] means NPS *Museum Handbook*, Part I, Chapter 2, Scope of Museum Collections, pages 8-9.

3. *Where do I find the checklist?*

See Figure E.2 for the checklist. An unpunched full size checklist accompanies this appendix. Keep the full size checklist as a master and make copies for your use.

C. List of Figures

Figure E.1	Example Approved Scope of Collection Statement	E:3
Figure E.2	Checklist for Evaluating Scope of Collection Statements	E:22

U.S. DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE

MESA VERDE NATIONAL PARK

SCOPE OF COLLECTION STATEMENT

Prepared by: Elizabeth Bowen 7/25/96
Park Curator Date

Recommended by: Linda C. Powell 7/25/96
Chief, Cultural Resource Management Date
Division

Approved by: Nancy Ames 7.26.96
Acting Park Superintendent Date

Figure E.1. Example Approved Scope of Collection Statement

SCOPE OF COLLECTION STATEMENT

Table of Contents

	<u>Page</u>
Title Page	
I. Introduction	1
II. Types of Collections	4
A. Cultural Collection	4
B. Natural History Collection	9
III. Museum Collections subject to the Native American Graves Protection and Repatriation Act of 1990	13
IV. Acquisition	14
V. Uses of Collections	15
VI. Restrictions	15
VII. Management Actions	17

Figure E.1. Example Approved Scope of Collection Statement (continued)

I. INTRODUCTION

This Scope of Collection Statement defines the scope of present and future museum collection holdings of Mesa Verde National Park that contribute directly to the understanding and interpretation of the park's purpose, themes and resources, as well as those objects that the Service is legally mandated to preserve. It is designed to ensure that the museum collection is clearly relevant to the park.

The National Park Service's (NPS) legal mandate for acquiring and preserving museum collections is contained in the *Antiquities Act of 1906* (16 USC 431-433), the *Organic Act of 1916* (16 USC 1 et. seq.), the *Historic Sites Act of 1935* (16 USC 461-467), the *Management of Museum Properties Act of 1955* (16 USC 18f), the *Reservoir Salvage Act of 1960*, as amended (16 USC 469-469c); the *Archeological and Historical Preservation Act of 1974* (16 USC 469-469c); the *National Historic Preservation Act of 1966*, as amended (16 USC 470-470t, Sec. 110), and the *Archaeological Resources Protection Act of 1979* (16 USC 470aa-mm).

Mesa Verde is the only national park in the United States whose primary goal is cultural resource protection and preservation. The enabling legislation (34 Stat. 616) which established Mesa Verde National Park on June 29, 1906 states, in part, that the park was established for the

"...preservation from injury or spoliation of the ruins and other works and relics of prehistoric or primitive man..."

The primary mission is therefore the proper management and preservation of cultural resources for the inspiration, benefit, and edification of the public. It has, however, a secondary mission to properly manage and preserve the natural resources. The park's museum collection is integral to both interpretive and management needs related to these two missions.

Many artifacts were removed from the sites presently within park boundaries prior to the establishment of the park, and nearly all of the artifacts recovered during park site preservation projects and archeological excavations conducted before 1923 were placed in the Smithsonian Institution. Efforts to assemble a museum collection within the park began in 1917 when one room of a log cabin, built in 1916 as a ranger station, was converted into a museum by the superintendent. He recognized the need for exhibits of artifacts from the sites of Mesa Verde. National Park Service support for this museum project consisted of an appropriation of \$22.00 for the construction of an exhibit case. The log cabin museum that opened in 1918, was one of the first museums built and operated by the National Park Service. The old log cabin museum was a success and served the public until 1925. It was later dismantled and then reconstructed near the present picnic area on Chapin Mesa. Today it is one of the park's most important historic buildings.

In 1921, Superintendent Jesse L. Nusbaum began an effort to build a large archeological museum on Chapin Mesa to replace the log cabin museum. His requests for support were repeatedly turned down. He finally turned to private citizens for assistance. Donations from Mrs. Stella Leviston,

Figure E.1. Example Approved Scope of Collection Statement (continued)

of San Francisco, and from Mr. John D. Rockefeller, Jr., provided the financial support necessary to build the museum and purchase exhibit cases. The Mesa Verde Archeological Museum was opened to the public in 1925. A major addition completed in 1936, gave the building its present form. Today it houses an outstanding collection of archeological objects from the park and adjacent areas. It is an important part of the park interpretive program and is listed in the National Register of Historic Places.

The Far View Visitor Center, opened to the public in 1969, as a museum, exhibits ethnographic artifacts from Southwest Native American groups. The majority of the material on exhibit was acquired by a gift from Mary Jane Colter.

Constructed in 1958 as a laboratory for processing archeological collections, the Mesa Verde Research Center stores the museum collections which are not on exhibit or on loan to other institutions. The Research Center also serves as the repository for the museum collections from Hovenweep and Yucca House national monuments. Park staff modified the Research Center to establish an appropriate collection storage space. These modifications were completed in 1982.

Mesa Verde National Park has several planning documents that have a direct bearing on the park's scope of collections. One of these plans, the Interpretive Prospectus (approved March 1981), identifies the following themes:

1. The evolution of southwestern culture: the Mesa Verde Ancestral Pueblo, their neighbors, antecedents, and descendants
2. Early Euro-American explorers and settlers of the Mesa Verde
3. Historic and modern Southwestern Native American art forms and their relationship to Ancestral Pueblo material culture
4. The natural history of the Four Corners area

The park's approved Resource Management Plan (approved October 1983) states that the "park is divided into four land classification zones. Eighty-two percent of the park is represented in the Historical/Cultural zone. This is appropriate because of the large number of prehistoric sites and cliff dwellings found in the area and which caused the land to be set aside as a national park." It also states, "No less important than the ruins themselves are the materials they still contain and those which have been collected in the past during authorized archeological investigations." This collection, which numbers close to 1.5 million individual objects, has an immense research potential. The plan states:

Figure E.1. Example Approved Scope of Collection Statement (continued)

"Much of it has not yet been properly studied, and even those portions which have been studied continue to yield new information as new procedures evolve in the analytical techniques of archeological research. Many individual items from the collection are displayed in the park's archeological museum, but the vast majority are housed in the Research Center where they are available both for use in the interpretive displays and for scholarly research. While less obvious to the casual visitor, the prehistoric collection constitutes a major cultural resource."

Another portion of the Resource Management Plan states, "While the emphasis of the park is on cultural themes, specifically history and prehistory and to a lesser extent, ethnography, the natural history of the park has become a secondary theme, one which is essential not only to a full understanding of the park as a whole, but also to a better understanding of certain aspects of its history and prehistory. As a result, extensive collections in the natural sciences have been assembled since the creation of the park."

The park's approved Statement for Management (approved 1986) lists the following management objectives related to resource preservation:

1. To preserve, protect and interpret the park's cultural and natural resources.
2. To provide for visitor use, safety and enjoyment of Mesa Verde's cultural and natural resources.
3. To provide the opportunity for and encourage research by bona fide educational institutions and qualified individuals.

The approved Statement for Management also states that "the primary and most significant features of Mesa Verde National Park are archeological." It follows that the archeological portion of the museum collection is the most important. This is in fact the case. Mesa Verde National Park manages one of the largest archeological collections in any national park. Archeological materials, except inalienable and communal property, recovered from within park boundaries through systematic collection are National Park Service property and must be retained in the park's museum collection in accordance with *43 CFR 7.13* and *NPS Management Policies* (Dec 88). The approved Statement for Management, and the General Management Plan also address concerns that the park's archeological resources are managed as part of the park's overall museum collection.

36 CFR 2.5g states that specimen collection permits issued by the Superintendent must contain the following conditions: "(1) Specimens placed in displays or collections will bear official National Park Service museum labels and their catalog numbers will be registered in the National Park Service National Catalog; and (2) Specimens and data derived from consumed specimens must be made available to the public and reports and publications resulting from a research specimen collection permit shall be filed with the superintendent."

Figure E.1. Example Approved Scope of Collection Statement (continued)

Other laws, regulations, directives and conventions pertinent to the acquisition of museum collections include: the *Lacey Act of 1900* (18 USC 43-44); the *Bald Eagle Protection Act of 1940* (16 USC 668a-668d); the *Migratory Bird Treaty Act of 1918* (16 USC 703-711); the *Marine Mammal Protection Act of 1972* (16 USC 1361-1407); the *Endangered Species Act of 1973*, as amended (16 USC 1531-1543); the *American Indian Religious Freedom Act of 1978* (42 USC 1996); the *Native American Graves Protection and Repatriation Act of 1990* (NAGPRA) (25 USC 3001-3013); the *Federal Property and Administrative Services Act of 1949*, as amended (40 USC 483[b]); the *Federal Records Act of 1950*, as amended ("Records Management by Federal Agencies" [44 USC 3101 et. seq.]); Federal Property Management Regulations (FPMR), 41 CFR 101; 410 Departmental Manual, Interior Property Management Regulations (IPMR); 411 Departmental Manual, "Museum Property Management," Chapters 1-3; "Curation of Federally-Owned and Administered Archeological Collections," 36 CFR 79; NAGPRA Final Regulations, 43 CFR 10; "Disposition of Federal Records," 36 CFR 1228; Preservation, Arrangement, Duplication, Exhibition of Records (44 USC 2109); Disposal of Records (44 USC 3301 et seq.); NPS Special Directive 87-2, "Conservation of Archeological Resources"; NPS Special Directive 91-4, "Ensuring that Natural Resource Projects Fund the Curation of Collections"; NPS Special Directive 94-6, "Ensuring that Projects Generating Museum Collections Fund Cataloging and Basic Preservation"; the 1983 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and the 1970 UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export, and Transfer of Ownership of Cultural Property (implemented in the United States by P.L. 97-446 in 1983, 19 USC 2601).

The prehistoric cultural resources of Mesa Verde National Park have received international recognition. The park was designated a World Heritage Cultural Park on September 8, 1978. It was the first cultural area so designated in the United States.

II. TYPES OF COLLECTIONS

The park's scope of collection includes archeological artifacts (c. 500-1200 A.D.) related to Ancestral Pueblo sites in the park and associated records; ethnological objects such as Pueblo Indian ceramics, watercolors, Navajo jewelry and textiles, Apache and Pima basketry; historical objects and archival and manuscript collections related to early exploration and homesteading, early park development and operation, and the Civilian Conservation Corps; herbarium housing specimens of each species of vascular plant found within the park and associated records; and other natural history specimens and associated records.

The interpretive themes, resource management goals and objectives, and mandates stated in the Introduction Section serve as guidance for acquiring objects for the park's museum collection. The park's museum collection is divided into two major categories: the cultural collection and the natural history collection.

Figure E.1. Example Approved Scope of Collection Statement (continued)

A. Cultural Collection

The purposes of this collection are to preserve a portion of our nation's cultural heritage and to increase knowledge and inspiration among present and future generations through exhibits, research, and interpretive programs. The cultural collection is sub-divided into three disciplines: archeology, ethnology, and history. The following list identifies by discipline object types appropriate to the park's museum collection and notes the current representation of these types of collections.

1. *Archeology*

Archeological collections are generated in response to cultural resource management requirements related to legal mandates, to development of park facilities, to preservation-related activities, to research requirements, and to interpretive needs. The archeological collection includes artifacts, human remains, and other materials obtained using archeological methods.

Uncontrolled surface collecting by visitors and park staff is discouraged. Artifacts found on the surface by visitors should not be removed from their original location by the finder. They should be reported to park staff. If materials are turned in to park staff, appropriate measures must be taken to ensure that the visitor collects no more material, that precise provenience information is recorded, if possible, and that the objects/data are promptly turned in to the Mesa Verde Research Center upon receipt by staff members.

The bulk of the museum collection consists of archeological material that includes:

- a. ***Ancestral Pueblo Material.*** Mesa Verde National Park has historically been considered the type locality of the Mesa Verde Branch of the Anasazi (Ancestral Pueblo) culture. The materials excavated from archeological sites within the park have provided the baseline data used to describe the material culture of these people, and it is an extremely important systematic research collection. The known occupation of Mesa Verde National Park is about A.D. 500 through the 1200's. The Mesa Verde Ancestral Pueblo did not "just appear", live in total isolation from their neighbors, nor "disappear". Therefore, examples of material culture from archeological sites outside the park are included in the museum collection to adequately interpret and to better understand the cultural development of the Mesa Verde Ancestral Pueblo. This material will continue to be collected on a limited basis. The objects must be relevant to the park's interpretive themes and be of scientific importance.

The park interprets the development of culture from the Paleo-Indian culture through the Ancestral Pueblo occupation of the Mesa Verde. Material culture remains from the Paleo-Indian, and Basketmaker II periods have not been recovered within Mesa Verde

Figure E.1. Example Approved Scope of Collection Statement (continued)

National Park. Therefore, the park has generally relied on loans of this material from other institutions to interpret these time periods through museum exhibits. The recent return of some of these objects to their owners has created serious gaps in the Archeology Museum's exhibits.

- b. ***Historic Material.*** The collection contains material from sites related to the settlement of the lands within the park during the late 1800's, and associated with early park development, from 1906 through 1943. Materials from both Euro-American sites and Native American sites are included in this category. Only archeological materials dating to the historic period and directly related to the above are included in the museum collection.
- c. ***Associated Records.*** All records associated with archeological collections are retained as part of the museum collection. These records include field notes and catalogs; daily journals; drawings and maps; photographic negatives, prints and slides; sound recordings; raw data sheets; instrument charts; remote sensing materials; artifact inventories, analytical study data; conservation treatment records; computer documentation and data; reports generated by archeological investigations; as well as any other documents generated through archeological or preservation activities.
- d. ***Confiscated Archeological Objects.*** These are objects recovered from unauthorized and illegal activities. They might include unearthened artifacts, ecofacts, and human remains illegally excavated or uncontrolled surface collecting by unauthorized individuals within the park boundaries. The museum curator should be consulted as soon as possible to ensure proper handling and transportation of these materials. Such objects might be held temporarily as evidence if legal action is to be taken, but should be formally turned over to the museum curator as soon as possible. The museum curator will maintain all such objects, following standard "chain of evidence" procedures, in the Mesa Verde Research Center. Once all legal questions are resolved, the objects and all associated documentation will be added to the museum collection.

2. *Ethnology*

a. *Objects*

Acquired, mostly through gifts between 1920 and 1950, the ethnology collection presently includes examples of Native American material culture from the Southwest, the Great Basin, and adjacent culture areas. These artifacts illustrate the cultural continuity of the Native American cultures of the Southwest, as well as their cultural adaptation and change as seen through their material culture. They also illustrate Native American artistic traditions in the Southwest and provide examples of the arts and crafts of groups with whom Mesa Verde National Park has been associated.

Figure E.1. Example Approved Scope of Collection Statement (continued)

The collection consists primarily of Pueblo Indian ceramics, watercolors, and jewelry, and Navajo jewelry and textiles. There are also a few fine examples of Apache basketry, Pima basketry, and Ute beadwork. The majority of these objects are currently on exhibit, and the collection serves more of an interpretive function than a research function because of the limited number of types of objects represented.

The park has important ties to the Ute tribe, but the collection of Ute material culture items is inadequate. Nearly all of the ethnographic artifacts on exhibit that are attributed to the Ute Indians are on loan to Mesa Verde National Park. The return of these objects to their owners would virtually eliminate this part of the park's interpretation. If interpretation of Ute culture is to continue, the park must collect additional examples of Ute material culture.

While the park will continue to acquire ethnographic material from all Native American groups in the Southwest, emphasis will be placed on the material culture of those groups within the Ancestral Pueblo geographic area.

b. *Associated Records*

All records associated with ethnographic collections are retained as part of the museum collection. These records may include field notes; interview schedules, tapes (video and audio), interview transcripts; negatives, prints and slides; data sheets (all subject to restrictions of confidentiality, if any); artifact inventories, analytical study data; conservation treatment records; computer documentation and data; reports generated by ethnographic investigations; as well as any other documents generated through ethnographic field work.

3. *History*

Only historic material which has a direct association with the park is included in the museum collection. When a large quantity of an object type is available, priority is given to acquiring the best preserved examples. The history collection is based on the park's themes used to establish the following collecting categories:

- a. *Early Exploration and Homesteading (Pre-1906)*. There are few objects directly associated with the early exploration and homesteading of the Mesa Verde area in the collection, and it is unlikely that much material of this type will become available. Known original field notes and photographs, such as those from the 1874 Hayden Survey, are now in the Smithsonian Institution. However, if original material of this nature becomes available, it should be collected.

Figure E.1. Example Approved Scope of Collection Statement (continued)

- b. ***Early Park Development (1906-1932).*** Material in this category includes original correspondence between park staff and resource specialists (e.g., Dr. Jesse Walter Fewkes); photographs, blueprints, specifications and other items documenting facility development and resource preservation activities; building furnishings; and staff personal items (e.g., Superintendent Schumacher's badge, 1911-13). The park will continue to collect staff member's personal items that directly relate to park activities and non-official documentary material, other than park administrative records, related to this time period that does not duplicate the material already in its possession.

Park administrative records, including duplicate copies of superintendent's reports, chief naturalist's reports, photographic prints, negatives, and slides are managed as part of the museum history collection.

- c. ***Civilian Conservation Corps (CCC, 1933-1942).*** The CCC period played an important role in the development of the park and in the preservation of park resources. Items in the museum collection from this period are: building furnishings, copies of administrative records, construction drawings, photographic documentation of projects, tools, art work (e.g., P.W.A. artwork, exhibition illustrations), and architectural features. If more material documenting CCC activities becomes available, it should be collected when it does not duplicate what is presently available. Areas where documentation is incomplete include camp life, identification of personnel in the photographic records on hand, and copies of camp publications (e.g., *Kiva Crier*).

Many of the park's administrative, maintenance, and residential buildings were either constructed or significantly modified during the CCC period, and are nominated to the National Register of Historic Places. Exceptions include mobile homes, the Research Center, modern buildings in the Far View area, and concessioner facilities in the campground. The museum collection should include representative samples of architectural fabric, documenting the original materials and workmanship of this period as it becomes available.

Some works of art, created as exhibition illustrations, have been included in the museum collection. Other important examples remain in the exhibits and these, along with some individual exhibits (e.g., dioramas) should become part of the museum collection.

- d. ***Current Events.*** Memorabilia from important current or commemorative events are included in the museum collection. Materials from the park's 75th anniversary and the First World Conference on Cultural Parks, for example, have been included. Materials from these types of activities will continue to be preserved as they become available.

Figure E.1. Example Approved Scope of Collection Statement (continued)

- e. *Rare Books and Manuscripts.* A small number of library materials (e.g., rare books and manuscripts) are included in the museum collection. The park library contains other rare books (e.g., Nordenskiöld's 1891 publication) which should also be included in the museum collection. Rare books and original manuscripts, having direct association with Mesa Verde National Park, will continue to be included in the museum collection.

Mesa Verde National Park's library includes a large number of books that are out of print, technical references, and administrative documents. This material, though valuable, will not be included in the museum collection and will continue to be managed under the park's library management plan. The library and printed matter in the museum collection both support the park's research, interpretive, and resource management programs.

In accordance with NPS-19, *Records Management Guideline*, the park library committee examines all current park files as they are disposed of to ensure retention of copies of non-official important materials in the park. Retained materials are managed as part of the museum collection. Policy and procedures for library collections are outlined in NPS *Management Policies* (Dec 88), Chapter 5; and Special Directive 94-1 (Feb 94), National Park Service (NPS) Library Program.

B. Natural History Collection

Collecting and maintaining a natural history collection, though of secondary importance to the cultural collection, is an important part of the management of the park's resources. The natural history collection exists to provide baseline data of park natural resources, to document changes these resources are undergoing because of internal park conditions and external effects, and to provide a database for researchers concerned with resource use by the park's prehistoric occupants.

The means by which the natural resource museum collection should grow is through authorized scholarly research, which is based on needs identified in this document and in the park's approved Resource Management Plan. This scholarly research may be conducted by park or non-park scientists. Collecting by park staff must be in compliance with the park's approved "Staff Field Collecting Procedures." The collecting of research specimens must comply with 36 CFR 2.5. All researchers must comply with applicable state and Federal laws regulating collecting, documenting collections, and other associated activities.

Three separate areas of the park, totalling 8,100 acres, were designated as wilderness in 1976. Park Mesa received designation as a "Research Natural Area" in 1966. All collecting of natural resource specimens that impacts these areas must take into consideration restrictions in effect because of these special designations.

Figure E.1. Example Approved Scope of Collection Statement (continued)

Natural resource specimens collected outside the park boundaries will not be included in the collection unless the specimens are required to illustrate interpretive exhibits, to augment specific park-related research projects or to demonstrate effects on park resources. Written permission from land owners or appropriate officials is obtained when collecting occurs on their land. This documentation must become part of the museum collection's accession file.

Taxidermy "mounts" and freeze dried specimens will be obtained only when a specific need (e.g., exhibit) is identified. Specialty collections such as frozen or other types of tissue samples are beyond the capability of the park to preserve. If they are collected and held by other repositories, they will be fully documented according to the applicable regulations. Archived soils and other strictly environmental monitoring samples will only be collected as part of authorized research projects.

This collection is divided into three disciplines: biology, geology, and paleontology. The following list identifies the categories of specimens which are to be included in the museum collection and notes their current representation.

1. *Biology*

- a. *Flora*. Each species of vascular plant growing in the park may be represented by a herbarium specimen, including fruit and flower, whenever possible. Additional specimens illustrating regional differences within the park as well as important variations in form, color, or hybrids, may also be included.

Major herbarium collections of vascular plants were made in the 1940's and 1960's. Thus, nearly all species are represented in the herbarium. The non-vascular flora are not well represented in the herbarium. One research project has been conducted in this area; a lichen study was conducted in 1981. Specimens from this project are in the Mesa Verde herbarium. Duplicate specimens are at the University of Arizona.

Three rare species of plants have been identified in Mesa Verde National Park. These are *Astragalus Schmollae*, C. L. Porter, *Astragalus deterior* (Barneby) Barneby, and *Hackelia gracilentia* (Johnston). Researchers must comply with all regulations governing these species.

- b. *Mammals*. Each species of non-endangered mammal occurring in the park should be represented by one good study skin and skull of an adult male, and an adult female. Immature individuals may be represented when found to show significant differences from adults. The collection may also include the minimum number of specimens needed to illustrate the range of morphological differences present in the species, to show seasonal and transitional stages of pelage, and to record local varieties. Additionally, complete skeletal remains, casts of tracks of fore and hind feet, and scats may be collected. The

Figure E.1. Example Approved Scope of Collection Statement (continued)

majority of the mammal specimens in the collection were collected in the 1930's. Not all species found in the park are represented.

A major research study of small mammals was conducted from 1989-1994. The study included the collection and preservation of small mammal species found in the park.

No known endangered, threatened, or rare species are known in the park.

- c. **Birds.** Each species of non-endangered bird occurring in the park, either as a migrant or resident, should be represented by one good study skin and skull of an adult male, and an adult female. Immature individuals may be represented when found to show significant differences from adults. The collection may also include the minimum number of specimens needed to illustrate the range of morphological differences present in the species, to show seasonal and transitional stages of plumage observed in the park, and to record local varieties. Additionally, complete skeletal remains, one nest of each species, the minimum number of eggs required to show variation, and pellets may be collected.

The majority of the bird specimens presently in the collection were collected in the 1930's. Not all species found in the park are represented.

Two threatened, endangered, or rare species have been recorded in the park. These are: *Haliaeetus leucocephalus* and *Falco peregrinus*. Researchers must comply with all regulations governing these species.

- d. **Reptiles and Amphibians.** Each species of non-endangered reptile and amphibian found in the park should be represented by one adult of each sex and a specimen of each distinctive developmental form. The collection may also include the minimum number of specimens needed to illustrate morphological differences found in the species or to demonstrate local variations. Few species of reptiles and amphibians are currently represented in the museum collection.

No known threatened, endangered, or rare species are found in the park.

- e. **Fish.** The Mancos River flows through the park on a portion of the eastern boundary, and the aquatic life found in this body of water in the park has not been studied to date. Each species of non-endangered fish found in the park may be represented by a limited series of specimens: One adult specimen of each sex, and the limited number of specimens required to document morphological differences within the species.

Figure E.1. Example Approved Scope of Collection Statement (continued)

No endangered, threatened, or rare species are known in the park.

- f. ***Insects and Arachnids.*** Each insect family occurring in the park should be illustrated by at least one adult specimen, but no more than will fill the smallest appropriate size of pinning tray. Insect larvae and soft bodied arachnids may be preserved in liquid. Species likely to arouse visitor interest because of their appearance, sound, bite, or sting should be represented by at least one properly mounted adult specimen, but by no more than will occupy the smallest appropriate size of pinning tray. Conspicuous larvae shall be included.

Species of importance in park management (e.g., parasites, museum pests, and others potentially requiring control measures) should be similarly represented. No known rare, threatened, or endangered species are found in the park.

- g. ***Other Invertebrates.*** Invertebrates other than those referred to above, both aquatic and terrestrial, are not well documented in the park. A small collection of land snails was made in the 1930's. These species may be represented in the collection by the minimal number of specimens required to adequately document them.
- h. ***Associated Records.*** All records associated with specimens collected in conjunction with biological research are retained with the specimens as part of the museum collection. These records include field notes; daily journals; maps and drawings; photographic negatives, prints, and slides; videotapes; sound recordings; raw data sheets; remote sensing data; copies of contracts; correspondence; repository agreements; specialists reports and analyses; reports and manuscripts; specimens inventories and field catalogs; analytical study data; computer documentation and data; tabulations and lists; specimen preparation records; conservation treatment records; and reports on all scientific samples lost through destructive analysis.

2. ***Geology***

- a. ***Rocks and Minerals.*** The minimum number of hand specimens, soil specimens, and mineral specimens required to document rock types, formations, soils and minerals found in the park should be collected. Additional specimens may be collected if needed to illustrate variations in structure or composition within the above units.
- b. ***Associated Records.*** All records associated with specimens collected in conjunction with geological research are retained with the specimens as part of the museum collection. These records include field notes; daily journals; maps and drawings; photographic negatives, prints, and slides; videotapes; sound recordings; raw data sheets; remote

Figure E.1. Example Approved Scope of Collection Statement (continued)

sensing data; copies of contracts; correspondence; repository agreements; specialists reports and analyses; reports and manuscripts; specimen inventories and field catalogs; analytical study data; computer documentation and data; tabulations and lists; specimen preparation records; conservation treatment records; and reports on all scientific samples lost through destructive analysis.

3. *Paleontology*

Uncontrolled surface collecting by visitors and park staff is discouraged. Fossils found on the surface by visitors should not be removed from their original location by the finder. They should be reported to park staff. If materials are turned in to park staff, appropriate measures must be taken to ensure that the visitor collects no more material, that precise provenience information is recorded, if possible, and that the objects/data are promptly turned in to the Mesa Verde Research Center upon receipt by staff members.

- a. *Invertebrate Fossils*. Each species found in the park should be represented by the minimum number of specimens required to fully document the horizontal and stratigraphic range of the species and the various habitats in which each species was fossilized. The collection contains a representative and well-documented collection of invertebrates, mainly from the Mancos Shale Formation.
- b. *Associated Records*. All records associated with specimens collected in conjunction with paleontological research are retained with the specimens as part of the museum collection. These records include field notes; daily journals; maps and drawings; photographic negatives, prints, and slides; videotapes; sound recordings; raw data sheets; remote sensing data; copies of contracts; correspondence; repository agreements; specialists reports and analyses; reports and manuscripts; specimen inventories and field catalogs; analytical study data; computer documentation and data; tabulations and lists; specimen preparation records; conservation treatment records; and reports on all scientific samples lost through destructive analysis.

III. MUSEUM COLLECTIONS SUBJECT TO THE NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT OF 1990

The *Native American Graves Protection and Repatriation Act of 1990* (NAGPRA), 25 USC 3001-13, requires, in addition to other actions, a written summary of unassociated funerary objects, sacred objects, and objects of cultural patrimony. The park's holdings that fall into these *NAGPRA* categories are listed in a Servicewide summary that was distributed to all Indian Tribes, Alaska Native villages, and Native Hawaiian organizations on October 27, 1993. Copies of this summary are on file in the park.

NAGPRA requires a written, item-by-item inventory of human remains and associated funerary objects to be completed no later than November 16, 1995. The park has human remains or

Figure E.1. Example Approved Scope of Collection Statement (continued)

associated funerary objects subject to *NAGPRA* in its museum collection. As of October 17, 1995, the park completed the inventory of Native American human remains and funerary objects. Copies of this inventory are on file in the park.

IV. ACQUISITION

The park acquires objects for its museum collections by gift, purchase, exchange, transfer, field collection, and loan. Acquisition of museum objects and archival and manuscript collections are governed by the park's ability to manage and preserve them according to *NPS Management Policies* (Dec 88), Chapter 5, the standards for managing museum objects in NPS-28, *Cultural Resources Management Guideline*, the revised Special Directive 80-1, "Guidance for Meeting NPS Preservation and Protection Standards for Museum Collections," (Mar 90), and the *NPS Museum Handbook*, Part I, "Museum Collections."

In accordance with NPS policy the park will discourage gifts with restrictions or limiting conditions. Incoming loans will be acquired only for a particular purpose such as research or exhibition, and for a specified period of time. Museum objects are acquired, accessioned, and cataloged in accordance with the *NPS Museum Handbook*, Part II, "Museum Records." In accordance with NPS-44, *Personal Property Management Guideline*, Chapter 9, all proposals for the acquisition of firearms and ammunition, except archeological field collections, must be reviewed by the System Support Office (SSO) Curator. Acquisition of firearms included on the Bureau of Alcohol, Tobacco, and Firearms (ATF) list of prohibited and restricted weapons requires concurrent review by the SSO Curator and Law Enforcement Specialist.

The Park Superintendent, by delegation, represents the Director and the Secretary of the Interior in accepting title to and responsibility for museum objects. The Superintendent bears the ultimate responsibility for the acquisition and proper care and management of the museum collection. The Superintendent has delegated the day-to-day care of the collection to the park curator.

All acquisitions must receive formal approval from the Park Superintendent before they can be accepted into the museum collection. Upon receipt, all newly acquired objects and related documentation must be turned over to the park curator. The park curator prepares, for the Superintendent's signature, all instruments of conveyance, and letters of thanks, acceptance, or rejection, and transmits them as appropriate, to the donor, lender, vendor, or other source of acquisition.

Donors of Ancestral Pueblo or other such cultural material must be able to demonstrate legal title to the materials and prove that they were not illegally removed from public lands. Gifts of this type of material are not ordinarily accepted unless they have been collected in a scientific manner and have adequate provenience data associated with them.

Collecting, either under permit or by park staff, will be approved only in response to the park's need for on-site reference or to establish baseline data. The museum collection will not be a repository for cultural or natural science specimens in excess of these needs.

Figure E.1. Example Approved Scope of Collection Statement (continued)

V. USES OF COLLECTIONS

To fulfill the goals of the park as described in the introduction, the park's museum collections may be used for exhibits, interpretive programs, research, and other interpretive media (e.g., publications based on museum objects or archival and manuscript collections). The governing consideration in the use of museum objects or archival materials is the conservation of each item in question and of the collection as a whole.

In accordance with NPS *Management Policies* (Dec 88), Chapter 7, the park will not exhibit Native American disinterred skeletal or mummified human remains or photographs or replicas of them. There will be no display of grave goods or other objects if Native Americans who are culturally affiliated with them object to such exhibit.

Researchers and other specialists may examine objects and archival materials under the conditions and procedures outlined in NPS-28, *Cultural Resources Management Guideline* and in the park's written "Guidelines for Access to the Museum Collection." Outside researchers normally must submit a research proposal to the Park Superintendent for review by the park's research committee. The research proposal is presented for review during consultation with different Pueblo tribes before access to the collection is granted. Any interpretive use that may be defined as consumptive must be authorized in advance, as outlined in NPS-28, Chapter 9 and NPS-6, *Interpretation and Visitor Services Guideline*.

Objects may be loaned out to qualified institutions for approved purposes in accordance with NPS *Museum Handbook*, Part II, Chapter 5, *Outgoing Loans* (1995). Institutions must meet minimal museum standards for security, handling and exhibition of NPS museum objects. Sensitive materials may require additional conditions prior to a loan commitment. Expenses related to loans of museum objects, including shipping and insurance, will normally be assumed by the borrower.

Photographs of museum objects are made available on a limited basis to provide an indirect use of the museum collection through publications and exhibits. Many of the park's archeological artifacts have been illustrated in publications.

All exhibits containing museum objects must have proper security, appropriate environmental controls, and proper mounts to ensure the long-term preservation of the objects.

VI. RESTRICTIONS

Restrictions in addition to those applying to the use of the museum collection outlined in Section IV of this statement are as follows:

Curatorial staff should consult with Tribal governments, Native Hawaiian organizations, Alaskan Native corporations, and traditional religious leaders about the terms and conditions for management of collections from Federal lands that have significance for these groups; and should consult with other indigenous and immigrant ethnic, social, and religious groups that have aboriginal or historic ties with the museum collection or lands of origin, and/or traditionally have used the museum collection. Archeological objects in the museum collection shall be made available to persons for

Figure E.1. Example Approved Scope of Collection Statement (continued)

use in religious rituals or spiritual activities in accordance with 36 CFR 79, Section 79.10(c), "Curation of Federally-owned and Administered Archeological Collections". Requests to borrow non-archeological material for religious ritual or spiritual activities will be addressed on a case-by-case basis.

The park will not approve research on human remains and associated funerary objects without the consent of the affected group(s).

Mesa Verde National Park will not knowingly be a partner to or encourage in any way the trafficking in illicitly or unscientifically collected materials.

NPS *Management Policies*, (Dec 88), Chapter 5, state: "Information regarding the location, nature, and character of archeological, historic, and ethnographic resources may be exempted from public disclosure." NPS *Management Policies*, (Dec 88), Chapter 5, state: "The identities of community consultants and information about sacred and other culturally sensitive places and practices will be kept confidential when research agreements or other circumstances warrant."

Restrictions may be placed on the publication of images or manuscripts in the museum collection if these materials are subject to copyright, and this right has not been signed over to the National Park Service.

All endangered, threatened, or rare plants and vertebrate and invertebrate animals will be collected only when accidentally killed or when dead from natural causes. The collection of threatened, endangered, or rare plant and animal species will comply with NPS *Management Policies* (Dec 88) and will be in accordance with the provisions of the *Endangered Species Act of 1973*, as amended, and will be strictly limited according to the applicable rules of the U.S. Fish and Wildlife Service. Specimens of species meeting these criteria may be added to the collection if they are accidentally killed or found dead of natural causes.

Final disposition of type specimens will be determined at the Servicewide level and will adhere to recognized conventions established for specific disciplines.

The following specific restrictions are applicable to:

Accession #231: The donor, Mr. S. L. Palmer, Jr., has stipulated that the records pertaining to this collection "remain as a unit" at Mesa Verde National Park.

Accession #333: The donor, Ms. Mary Jane Colter, stipulates that the Service must not refer to the objects included in her gift as a "collection."

Figure E.1. Example Approved Scope of Collection Statement (continued)

VII. MANAGEMENT ACTIONS

This Scope of Collection Statement must be reviewed every two years, and when necessary, must be revised to remain supportive of and consistent with any changes in the park's mission. Any revision to this document requires the approval of the Park Superintendent.

The park has an approved Collection Management Plan. It was approved on June 22, 1988.

The park staff is compiling data on collections in other institutions which were removed from archeological sites within Mesa Verde National Park. Major collections were removed from the archeological sites presently within the park boundaries before its creation in 1906 and during the first two decades of the park's existence. The list of institutions in the United States that have important collections from Mesa Verde includes: the Colorado Historical Society in Denver, Phoebe Hearst Museum of Anthropology in Berkeley, the Smithsonian Institution, and the University of Pennsylvania in Philadelphia, and the National Biology Survey Museum of Southwest Biology in Albuquerque, NM. Part of the material removed from Mesa Verde prior to its establishment as a National Park has not remained in the United States. A notable collection made in 1891 by the Swedish scientist Gustav Nordenskiöld is presently in the Finnish National Museum at Helsingfors, and in the Ethnografiska Museum in Stockholm. These collections still contain a wealth of information which has not been fully analyzed to date.

The continued use of cataloged historic furniture in public spaces is being evaluated in accordance with NPS guidelines.

Recall of objects loaned to the park is a possibility. The park needs to seek ownership of exhibited objects on long-term loan in order to prevent potential disruption of permanent interpretive exhibits.

Figure E.1. Example Approved Scope of Collection Statement (continued)

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

Unit's Name: _____

Draft _____ Approved _____ Date: _____

Reviewed by: _____ Date: _____

	YES	NO
A. Does the SOCS have <i>TITLE PAGE</i> ?	_____	_____
1. Is Title Page format correct? [MH-I,2:6]	_____	_____
2. Does Title Page include all required signatures and dates?	_____	_____
B. Does the SOCS have <i>INTRODUCTION</i> section?	_____	_____
1. Is purpose of SOCS stated? [MH-I,2:5]	_____	_____
2. Are NPS legal authorities (laws) to acquire and preserve museum objects cited? [MH-I,2:5&7]	_____	_____
3. a. Is unit's mission stated?	_____	_____
b. Is unit's enabling legislation cited?	_____	_____
c. If applicable, is subsequent unit's legislation cited?	_____	_____
4. If applicable, is there a statement indicating that museum collection is mandated by unit's enabling or subsequent legislation?	_____	_____
5. <i>Unit's Interpretive Themes</i> :		
a. Are interpretive themes listed?	_____	_____
b. Are interpretive periods listed?	_____	_____
c. If available, are appropriate planning documents (title/date) cited?	_____	_____
6. <i>Unit's Resource Management Goals and Objectives</i> :		
a. Are pertinent cultural and natural resource management goals and objectives listed?	_____	_____
b. If available, are appropriate planning documents (title/date) cited?	_____	_____
7. <i>Mandated Collections</i> :		
a. Is statement, citing 43 CFR 7.13 and NPS Management Policies (Dec 88), pp. 5:3-4, made that archeological collections are managed as part of the unit's museum collection? [MH-I,2:8]	_____	_____
b. Is statement citing 36 CFR 2.5g made relevant to curatorial requirements for natural history specimens collected by approved permits? [MH-I,2:8]	_____	_____
8. Is there a discussion of the significance and history of the collection (optional)?	_____	_____
9. Are other laws, regulations, conventions, and special directives relevant to acquisition of museum objects cited? [MH-I,2:8-9]	_____	_____
10. If applicable, are any special unit designations (e.g., MAB Reserve, National Historic Landmark, World Heritage Site) that may be pertinent to museum collection cited?	_____	_____

Figure E.2. Checklist for Evaluating Scope of Collection Statements

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

	YES	NO
C. Does the SOCS have <i>TYPES OF COLLECTIONS</i> section?	___	___
1. Is there a brief profile of the unit's museum collection? [MH-I,2:9-10]	___	___
2. Is there an introductory statement indicating that INTRODUCTION section states purpose of collection?	___	___
3. Is section divided into two major categories: Natural History Collection and Cultural Collection?	___	___
4. <i>Natural History Collection Category:</i>		
a. If appropriate, is there a statement that the unit does not collect/maintain a natural history collection for its own purposes?	___	___
b. If unit collects/maintains a natural history collection is there an introductory paragraph that briefly outlines the purpose of this collection? [MH-I,2:10-11]	___	___
c. Is major category subdivided into disciplines (Biology, Geology, Paleontology) pertinent to unit?	___	___
d. Is each discipline subdivided into collecting categories that reflect unit's purpose for collection?	___	___
e. If appropriate, under each collecting category:		
1) Is current representation of object types described?	___	___
2) Are priorities established to fill identified deficiencies (gaps) in existing collection?	___	___
3) Are limits (quantities) defined?	___	___
f. Is there a collecting category for "associated records," under each discipline?	___	___
g. Does paleontology discipline include a statement relevant to "uncontrolled surface" collecting?	___	___
5. <i>Cultural Collection Category:</i>		
a. Does introductory paragraph include a statement that describes the purpose of this collection? [MH-I,2:11-12]	___	___
b. Does introductory paragraph state that an object or archival and manuscript collection from site or directly associated to person(s) or event(s) commemorated by the unit is more desirable than a similar object without such primary association?	___	___
c. Is major category subdivided into disciplines pertinent to the unit (Archeology, Ethnology, History, Archives)?	___	___
d. Is each discipline subdivided into collecting categories that reflect the unit's purpose for collection?	___	___
e. If appropriate, under each collecting category:		
1) Is current representation of object or archival types described?	___	___
2) Are priorities established to fill identified deficiencies (gaps) in existing collection?	___	___
3) Are limits (quantities) defined?	___	___
f. Does archeology discipline include collecting categories for "artifacts and specimens" and "associated records"?	___	___
g. Does archeology discipline include a statement relevant to "uncontrolled surface" collecting?	___	___

Figure E.2. Checklist for Evaluating Scope of Collection Statements (continued)

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

	<u>YES</u>	<u>NO</u>
D. Does the SOCS have <i>MUSEUM COLLECTIONS SUBJECT TO THE NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT OF 1990</i> section?	_____	_____
1. Does section contain appropriate statement regarding the required summary of unassociated funerary objects, sacred objects, and objects of cultural patrimony? [MH-I,2:20-21]	_____	_____
2. Does section contain appropriate statement regarding the required inventory of human remains and associated funerary objects? [MH-I,2:21]	_____	_____
E. Does the SOCS have <i>ACQUISITION</i> section? [MH-I,2:21-22]	_____	_____
1. Is there a statement describing types of potential acquisition sources?	_____	_____
2. Does section include statement that acquisition of objects is governed by unit's capability to preserve its museum collection in accordance with NPS <i>Management Policies</i> (Dec 88), NPS-28, Special Directive 80-1, and NPS <i>Museum Handbook</i> , Part I (Sep 90)?	_____	_____
3. Is there a statement that discourages gifts with restrictions or limiting conditions?	_____	_____
4. In accordance with NPS-44, Chapter 9, does section state that the acquisition of all firearms and ammunition, except those recovered from field collections, must be reviewed prior to acceptance by the SSO curator?	_____	_____
5. Does section state that acquisition of firearms included on the Bureau of Alcohol, Tobacco, and Firearms (ATF) list of prohibited and restricted weapons requires concurrent review prior to acceptance by SSO curator and law enforcement specialist?	_____	_____
6. Does section state that museum objects must be acquired, accessioned, and cataloged in accordance with NPS <i>Museum Handbook</i> , Part II?	_____	_____
7. Is there a statement regarding delegation of authority to the unit's superintendent to accept title to and responsibility for museum collections?	_____	_____
8. Does this section outline any park-specific acquisition procedures that supplement NPS policies?	_____	_____
F. Does the SOCS have <i>USES OF COLLECTIONS</i> section? [MH-I,2:23]	_____	_____
1. Is there a description of desired and acceptable uses?	_____	_____
2. Is there a statement regarding conservation as a primary consideration when determining uses?	_____	_____
3. In accordance with the NPS <i>Management Policies</i> (Dec 88), Chapter 7, page 5, "Interpretation and Native Americans," does section state that unit shall not place skeletal or mummified human remains, grave goods or other objects considered sacred on display?	_____	_____
4. Is there a statement regarding access to museum collection?	_____	_____
5. Does section reference NPS-28 and NPS-6 relevant to potentially consumptive uses of museum objects?	_____	_____
6. Does section reference NPS-28 relevant to research/destructive analysis of museum objects?	_____	_____

Figure E.2. Checklist for Evaluating Scope of Collection Statements (continued)

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

	<u>YES</u>	<u>NO</u>
G. Does the SOCS have <i>RESTRICTIONS</i> section? [MH-I,2:23-24]	___	___
1. Does section include a statement regarding consultation with Tribal governments, Native Hawaiian organizations, Alaskan Native Corporations, and traditional religious leaders? [MH-I,2:24]	___	___
2. Does section state NPS policy relevant to disclosure of information on location, nature, and character of archeological resources?	___	___
3. Does section state NPS policy relevant to keeping confidential identities of community consultants and information about sacred and other culturally sensitive places and practices?	___	___
4. Is there a statement regarding use of objects subject to copyright?	___	___
5. If appropriate, is there a statement relevant to the collecting of endangered, threatened, or rare species?	___	___
6. Does section identify any legal restrictions on disposition or uses of the unit's museum collection?	___	___
H. Does the SOCS have a <i>MANAGEMENT ACTIONS</i> section? [MH-I,2:25]	___	___
1. Are there statements that require the following:		
a. Periodic review of SOCS?	___	___
b. SOCS remains supportive of and consistent with unit's mission?	___	___
c. Unit superintendent's approval of any revisions to SOCS?	___	___
2. Does section document existence of or need for a Collection Management Plan?	___	___
3. If any collections are located outside the unit's boundaries, is a brief description of each collection and name and location of each repository identified?	___	___
I. <i>Comments/Recommendations</i> (If needed, attach additional pages.):		
___ See attached copy of unit's approved or draft Scope of Collection Statement for editorial comments.		
___ Determine information needed to evaluate questions answered by "ND" ("Not Determined").		
___ Revise the SOCS to correct the deficiencies noted in the checklist. See NPS <i>Museum Handbook</i> , Part I, Chapter 2, Scope of Museum Collections (1994), Section C, for guidance on writing a Scope of Collection Statement.		

Figure E.2. Checklist for Evaluating Scope of Collection Statements (continued)

FULL SIZE CHECKLIST

- **This full size Checklist for Evaluating Scope of Collection Statements is for your use.**
- **Save as a master set.**
- **Copy as needed.**

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

Unit's Name: _____

Draft _____ Approved _____ Date: _____

Reviewed by: _____ Date: _____

	YES	NO
A. Does the SOCS have <i>TITLE PAGE</i> ?	_____	_____
1. Is Title Page format correct? [<i>MH-I,2:6</i>]	_____	_____
2. Does Title Page include all required signatures and dates?	_____	_____
B. Does the SOCS have <i>INTRODUCTION</i> section?	_____	_____
1. Is purpose of SOCS stated? [<i>MH-I,2:5</i>]	_____	_____
2. Are NPS legal authorities (laws) to acquire and preserve museum objects cited? [<i>MH-I,2:5&7</i>]	_____	_____
3. a. Is unit's mission stated?	_____	_____
b. Is unit's enabling legislation cited?	_____	_____
c. If applicable, is subsequent unit's legislation cited?	_____	_____
4. If applicable, is there a statement indicating that museum collection is mandated by unit's enabling or subsequent legislation?	_____	_____
5. <i>Unit's Interpretive Themes</i> :		
a. Are interpretive themes listed?	_____	_____
b. Are interpretive periods listed?	_____	_____
c. If available, are appropriate planning documents (title/date) cited?	_____	_____
6. <i>Unit's Resource Management Goals and Objectives</i> :		
a. Are pertinent cultural and natural resource management goals and objectives listed?	_____	_____
b. If available, are appropriate planning documents (title/date) cited?	_____	_____
7. <i>Mandated Collections</i> :		
a. Is statement, citing <i>43 CFR 7.13</i> and <i>NPS Management Policies</i> (Dec 88), pp. 5:3-4, made that archeological collections are managed as part of the unit's museum collection? [<i>MH-I,2:8</i>]	_____	_____
b. Is statement citing <i>36 CFR 2.5g</i> made relevant to curatorial requirements for natural history specimens collected by approved permits? [<i>MH-I,2:8</i>]	_____	_____
8. Is there a discussion of the significance and history of the collection (optional)?	_____	_____
9. Are other laws, regulations, conventions, and special directives relevant to acquisition of museum objects cited? [<i>MH-I,2:8-9</i>]	_____	_____
10. If applicable, are any special unit designations (e.g., MAB Reserve, National Historic Landmark, World Heritage Site) that may be pertinent to museum collection cited?	_____	_____

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

	<u>YES</u>	<u>NO</u>
C. Does the SOCS have <i>TYPES OF COLLECTIONS</i> section?	___	___
1. Is there a brief profile of the unit's museum collection? [MH-I,2:9-10]	___	___
2. Is there an introductory statement indicating that INTRODUCTION section states purpose of collection?	___	___
3. Is section divided into two major categories: Natural History Collection and Cultural Collection?	___	___
4. <i>Natural History Collection Category:</i>		
a. If appropriate, is there a statement that the unit does not collect/maintain a natural history collection for its own purposes?	___	___
b. If unit collects/maintains a natural history collection is there an introductory paragraph that briefly outlines the purpose of this collection? [MH-I,2:10-11]	___	___
c. Is major category subdivided into disciplines (Biology, Geology, Paleontology) pertinent to unit?	___	___
d. Is each discipline subdivided into collecting categories that reflect unit's purpose for collection?	___	___
e. If appropriate, under each collecting category:		
1) Is current representation of object types described?	___	___
2) Are priorities established to fill identified deficiencies (gaps) in existing collection?	___	___
3) Are limits (quantities) defined?	___	___
f. Is there a collecting category for "associated records," under each discipline?	___	___
g. Does paleontology discipline include a statement relevant to "uncontrolled surface" collecting?	___	___
5. <i>Cultural Collection Category:</i>		
a. Does introductory paragraph include a statement that describes the purpose of this collection? [MH-I,2:11-12]	___	___
b. Does introductory paragraph state that an object or archival and manuscript collection from site or directly associated to person(s) or event(s) commemorated by the unit is more desirable than a similar object without such primary association?	___	___
c. Is major category subdivided into disciplines pertinent to the unit (Archeology, Ethnology, History, Archives)?	___	___
d. Is each discipline subdivided into collecting categories that reflect the unit's purpose for collection?	___	___
e. If appropriate, under each collecting category:		
1) Is current representation of object or archival types described?	___	___
2) Are priorities established to fill identified deficiencies (gaps) in existing collection?	___	___
3) Are limits (quantities) defined?	___	___
f. Does archeology discipline include collecting categories for "artifacts and specimens" and "associated records"?	___	___
g. Does archeology discipline include a statement relevant to "uncontrolled surface" collecting?	___	___

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

YES NO

D. Does the SOCS have *MUSEUM COLLECTIONS SUBJECT TO THE NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT OF 1990* section?

1. Does section contain appropriate statement regarding the required summary of unassociated funerary objects, sacred objects, and objects of cultural patrimony? [MH-I,2:20-21]
2. Does section contain appropriate statement regarding the required inventory of human remains and associated funerary objects? [MH-I,2:21]

E. Does the SOCS have *ACQUISITION* section? [MH-I,2:21-22]

1. Is there a statement describing types of potential acquisition sources?
2. Does section include statement that acquisition of objects is governed by park's capability to preserve its museum collection in accordance with NPS *Management Policies* (Dec 88), NPS-28, Special Directive 80-1, and NPS *Museum Handbook*, Part I (Sep 90)?
3. Is there a statement that discourages gifts with restrictions or limiting conditions?
4. In accordance with NPS-44, Chapter 10, does section state that the acquisition of all firearms and ammunition, except those recovered from field collections, must be reviewed and approved by the SSO curator?
5. Does section state that acquisition of firearms included on the Bureau of Alcohol, Tobacco, and Firearms (ATF) list of prohibited and restricted weapons requires concurrent review prior to acceptance by SSO curator and law enforcement specialist?
6. Does section state that museum objects must be acquired, accessioned, and cataloged in accordance with NPS *Museum Handbook*, Part II?
7. Is there a statement regarding delegation of authority to the unit's superintendent to accept title to and responsibility for museum collections?
8. Does this section outline any unit-specific acquisition procedures that supplement NPS policies?

F. Does the SOCS have *USES OF COLLECTIONS* section? [MH-I,2:23]

1. Is there a description of desired and acceptable uses?
2. Is there a statement regarding conservation as a primary consideration when determining uses?
3. In accordance with the NPS *Management Policies* (Dec 88), Chapter 7, page 5, "Interpretation and Native Americans" does section state that unit shall not place skeletal or mummified human remains, grave goods or other objects considered sacred on display?
4. Is there a statement regarding access to museum collection?
5. Does section reference NPS-28 and NPS-6 relevant to potentially consumptive uses of museum objects?
6. Does section reference NPS-28 relevant to research/destructive analysis of museum objects?

CHECKLIST FOR EVALUATING SCOPE OF COLLECTION STATEMENTS

YES NO

- | | | | |
|----|---|---|---|
| G. | Does the SOCS have <i>RESTRICTIONS</i> section? [MH-I,2:23-24] | — | — |
| 1. | Does section include a statement regarding consultation with Tribal governments, Native Hawaiian organizations, Alaskan Native Corporations, and traditional religious leaders? [MH-I,2:24] | — | — |
| 2. | Does section state NPS policy relevant to disclosure of information on location, nature, and character of archeological resources? | — | — |
| 3. | Does section state NPS policy relevant to keeping confidential identities of community consultants and information about sacred and other culturally sensitive places and practices? | — | — |
| 4. | Is there a statement regarding use of objects subject to copyright? | — | — |
| 5. | If appropriate, is there a statement relevant to the collecting of endangered, threatened, or rare species? | — | — |
| 6. | Does section identify any legal restrictions on disposition or uses of the unit's museum collection? | — | — |
| | | | |
| H. | Does the SOCS have a <i>MANAGEMENT ACTIONS</i> section? [MH-I,2:25] | — | — |
| 1. | Are there statements that require the following: | | |
| a. | Periodic review of SOCS? | — | — |
| b. | SOCS remains supportive of and consistent with unit's mission? | — | — |
| c. | Unit superintendent's approval of any revisions to SOCS? | — | — |
| 2. | Does section document existence of or need for a Collection Management Plan? | — | — |
| 3. | If any collections are located outside the unit's boundaries, is brief description of each collection and name and location of each repository identified? | — | — |

I. *Comments/Recommendations* (If needed, attach additional pages.):

___ See attached copy of unit's approved or draft Scope of Collection Statement for editorial comments.

___ Determine information needed to evaluate questions answered by "ND" ("Not Determined").

___ Revise the SOCS to correct the deficiencies noted in the checklist. See NPS *Museum Handbook*, Part I, Chapter 2, Scope of Museum Collections (1994), Section C for guidance on writing a Scope of Collection Statement.

Appendix G: Protection of National Park Service Museum Collections

	<u>Page</u>
A. Overview	G:1
B. NPS Standards for Security and Fire Protection	G:1
What general standards do I need to meet?	G:1
What security standards do I need to meet?	G:1
What fire protection standards do I need to meet?	G:2
C. Museum Security and Fire Protection Surveys	G:3
What are the subjects that I need to address in a security survey?	G:3
Where can I obtain a sample scope of work for a security and fire protection survey?	G:6
D. Park Museum Standard Operating Procedures and Agreements	G:6
How do I organize museum standard operating procedures?	G:6
Where do I find sample museum standard operating procedures and agreements?	G:7
Where do I find additional help with preparing access policies and procedures?	G:7
Where do I find a sample visitor log?	G:7
Where do I find conditions for access to museum collections?	G:8
E. Mandates and Requirements for Emergency Management for Museum Collections . . .	G:8
What laws and regulations do I need to know?	G:8
What do the NPS Management Policies tell me?	G:8
What NPS guidelines do I need to know?	G:8
What are the NPS standards for museum emergency management?	G:9
F. Glossary	G:9
G. List of Figures	G:14

APPENDIX G. PROTECTION OF NATIONAL PARK SERVICE MUSEUM COLLECTIONS

A. Overview

This appendix contains information that supports the guidance we provide in *NPS Museum Handbook*, Part I, Chapter 9, Museum Collections Security and Fire Protection and Chapter 10, Emergency Planning. In this appendix you will find:

- NPS standards for security and fire protection
 - Definitions of security and fire protection terms
 - Sample statements of work for security and fire protection surveys
 - Sample standard operating procedures and agreements
 - Mandates and requirements for emergency management
-

B. NPS Standards for Security and Fire Protection

1. *What general standards do I need to meet?*

- Identify all threats that may affect the museum collection and take steps to counter those threats.
- Ensure that the park's museum protection program applies to everyone on the staff.
- Implement a thorough and vigorously enforced fire prevention program in buildings housing museum collections and museum records.
- Ensure that systems for detecting and controlling access meet Underwriters Laboratories (UL) standards and systems for detecting and suppressing fires meet UL and National Fire Protection Association (NFPA) standards.
- Establish a process for evaluating plans for building and exhibit construction and rehabilitation to ensure that security and fire protection objectives will be met.

The NPS Checklist for Preservation and Protection of Museum Collections (1996) includes mandatory standards for museum security and fire protection. See *MH-I*, Appendix F: NPS Museum Collections Management Checklists, Section A for guidance.

2. *What security standards do I need to meet?*

- Issue keys to storage rooms and exhibit cases only to those employees who have a frequently (at least daily) recurring need for direct, unaccompanied access to collections.
- Control the issuing of keys strictly by using signed hand receipts (Form DI-105, "Receipt for Property" or its equivalent).

- Write and implement procedures for access to museum collections.
- Ensure that researchers or qualified visitors entering a space housing museum objects are accompanied at all times by someone on the park museum staff.
- Maintain a visitor log to record non-museum staff entries into museum storage and work areas.
- Write and implement opening and closing procedures for museum exhibit, storage, research and work spaces.
- Equip museum storage rooms with secure metal or solid-core wooden doors in substantial frames. Equip those doors with deadbolt locks and other appropriate security hardware, such as non-removable pin hinges.
- Install and maintain intrusion detection systems appropriate to the nature of the facility, the nature and value of the collection, and to the known threats.
- Ensure that intrusion detection systems are inspected and maintained on a regular schedule.
- House highly sensitive and valuable objects (such as firearms) in storage cabinets of an appropriate design with keyed or combination locks.
- Protect irreplaceable or particularly sensitive or valuable objects on exhibit by using appropriate mounts, cases, or security electronics (or some combination of the three) or by other means that will protect them from theft or vandalism without making curatorial access or visitor viewing impractical or difficult.
- Give museum objects, especially those on exhibit, additional protection at times of high risk, such as during special events or when exhibit galleries are particularly crowded, or when uniquely threatened, such as by terrorist threats or attack or during times of civil unrest.
- Incorporate the needs of museum objects and museum records in the Structural Fire Plan.
- Keep all museum property records (paper and electronic) in appropriate locking fire-resistant filing cabinet, safe, or walk-in vault.
- Protect spaces housing museum collections by automatic fire detection and suppression systems appropriate to the risks involved, the nature of the collection, the nature of the fires that could occur in those spaces (including attention to fuel types and loading), the nature of the structure, and the capabilities and timeliness of responding forces.
- Protect spaces housing collections by appropriately rated, sized, and located portable fire extinguishers.

3. *What fire protection standards do I need to meet?*

- Instruct designated park staff in proper techniques to prevent and suppress fires and in emergency evacuation and protection of people, structures, and collections.
 - Ensure that storage shelves and cabinets and exhibit cases do not obstruct discharge of a suppression agent. Minimize potential damage to objects from agent discharge by ensuring that objects are in cabinets or under protective covers.
 - Keep flammable solvents and supplies in museum work spaces only when kept in UL approved safety containers stored inside UL approved flammable storage cabinets. Never house flammable solvents and supplies in collection storage spaces.
 - Prohibit smoking and open flames in collection storage, work, and exhibit areas.
 - Store cellulose nitrate photographic negatives and motion picture film and other flammable or hazardous objects separately from the rest of the museum collection.
 - Construct storage areas and, where possible, exhibit areas of fire-resistant materials.
-

C. Museum Security and Fire Protection Surveys

1. *What are the subjects that I need to address in a security survey?*

The outline below lists subjects that may be addressed during a protection survey.

- The Park or Facility
 - Name or other identifier
 - Function or purpose
 - Location (including proximity to other facilities and communities)
 - Physical nature of the facility and its surroundings
 - Climate
 - Staffing (including nature and size of staff, hours, seasonal variations)
 - Visitor access (including visitor use characteristics, numbers of visitors, hours, seasonal variations)
 - The law enforcement situation (including type of jurisdiction, reaction/response times)
 - Site loss history (including nature/impact of past criminal activity, nature/impact of other loss events, subsequent mitigating/preventive actions, current loss control policies, programs, procedures)

- Perimeter Security (External)
 - Perimeter barriers and access points: nature and effectiveness (including fences, natural barriers, clear zones, underground passages)
 - Cover (such as vegetation) for possible illegal activity
 - Lighting (including nature, location and areas of coverage, maintenance and testing, power supply, circuit, and switching reliability, tamper resistance, operation)
 - Access points (including controls such as gates, locks, and surveillance)
 - Patrols (including nature, frequency, and seasonal variations)
 - Intrusion detection system (including type of system, power supply, tamper resistance, signal transmission method(s) and supervision)
 - Inspection, testing, and maintenance, operating procedures and instructions, and monitoring of alarms
- The Structure Housing Museum Collections
 - Perimeter security (such as doors, windows, loading docks, walls, roofs, floors, basements, attics, and underground tunnels)
 - Interior security (such as connecting doors and pass-throughs, walls and interior windows, ceilings and spaces above them, floors and crawl spaces, duct work, storerooms, closets, utility rooms, vaults, storage cabinets, elevators and stairwells, and hiding places)
 - Locks and related hardware (including types, mounting, and cylinders and keys)
 - Interior lighting (including security, emergency types, mounting, and cylinders and keys, lighting reliability)
 - Intrusion detection system (including detectors, controls, tamper resistance of wiring and components, alarm transmission methods and supervision, inspection, testing, and maintenance, operating procedures and instructions, monitoring of alarms)
 - Fire detection systems (including detectors, controls, power supply, tamper resistance of wiring and components, alarm transmission methods and supervision, inspection, testing, and maintenance, operating procedures and instructions, monitoring alarms)
 - Fire suppression systems (including appropriateness relative to threats, reliability, supervision, inspection, testing, and maintenance, response to activation)
 - Fire prevention programs (including policies and procedures, housekeeping, staff training, evacuation)

- Safes, vaults, and media containers (including type, location, capacity, and use)
- Procedures
 - Key and combination control (including policies and procedures, documentation/records, and security of keys and cores)
 - Building opening and closing (including policies and procedures, checklists, and monitoring by management)
 - Housekeeping practices
 - Employee screening, investigation, and identification
 - Package and material control
 - Visitor control (including control of visitors to staff-only areas, passes, records of visits, and ID's for contractors, tradesmen, utility workers)
 - Visitor surveillance and inspection
 - Protection of administrative records
 - Security of cash and valuables
 - Control of access to restricted areas or facilities (including museum and non-museum staff)
 - Property inventory and control
 - Security communications (including methods, reliability, back-up power, employee operation, and efficiency and speed)
 - Incident reporting (including timeliness, accuracy, and records creation and maintenance)
- Individual Object Protection
 - Storage spaces (including physical construction, access control, housekeeping practices, storage cabinets and shelves, inventory and material movement, and intrusion detection systems)
 - Exhibit spaces (including case construction and object mounting, lighting of space and cases, surveillance by the staff, intrusion and tamper detection systems, inventory, and object removal/movement procedures)
 - Furnished rooms (including access control, intrusion detection systems, housekeeping practices, and inventory)

2. *Where can I obtain a sample scope of work for a security and fire protection survey?*

Figures G.1 and G.2 provide suggested language for a scope of work (SOW) statement for a security survey and a fire protection survey. When contracting for a combined security and fire protection survey, the two documents can be merged and redundant language eliminated. In the sample SOWs, the square brackets [] denote alternative words or phrases, one of which must be chosen and the other deleted, depending upon the situation. Square brackets also mark off optional words and phrases that may be applicable. The text for these sample statements of work is available on diskette or via cc:Mail from your SSO Curator.

D. Park Museum Protection Standard Operating Procedures and Agreements

1. *How do I organize museum standard operating procedures?*

In preparing park-level policy statements and procedures, it is important to distinguish between policies and procedures. Policies express what is allowed and not allowed. Procedures express how to carry out the policies (how, when, by whom, and under what circumstances you put the policies into effect.)

Museum facility standard operating procedures (SOPs) share certain common elements with all standard operating procedures. They all include the following information:

- **Why** the required actions should be performed. When the purposes for having the SOP are made clear, and when the responsible staff fully understand why they must do certain things, the procedures become more valuable.
- **Who** is to perform the required actions. Depending on the circumstances, the SOP may indicate responsibility by name or by position title. The SOP will say that the procedures are to be followed by staff who have the duty by virtue of some roster or work schedule (which you must identify in the SOP). Regardless of how it is done, it is essential that the SOP assign specific responsibility.
- **When** the required actions are to be performed. Usually, specific times are given for either initiating or completing the procedures. The times may vary seasonally or according to the day of the week. It may not be necessary to set a specific time for initiating each action. Simply setting a time to begin the procedures or a time by which they are to be completed will suffice.
- **Where** the required actions are to be performed. For example, an opening SOP might designate which building entrance is to be opened first, indicate where the intrusion detection system keypad and light switches are located, direct the sequential unlocking of specific emergency exit or other doors, specify where items needed during the procedure, such as flags, are to be found, and indicate which exhibit cases are to be checked.
- **How** the required actions must be performed or, as appropriate, may be performed. Unless there is a clear need for an action to be

performed in a certain way, however, it is best to allow the responsible persons flexibility in how they carry out their tasks. When an action must be performed in a certain way, as with operating an intrusion detection system or certain high-security locks, the SOP then should be as specific and detailed as necessary to ensure that it is done that way.

- **What** the results of the actions should be. For example, it is not sufficient to say something like "Check all exhibit cases." Instead, the SOP should say "Visually examine exhibit cases 4-13 for evidence of burglary or tampering during the night and for objects and graphics that might have fallen or come loose from their mounts. Inspect exhibit case access doors to ensure that they are still locked and that the locks are in good condition."

2. *Where do I find sample museum standard operating procedures and agreements?*

Figures G.3 through G.8 provide suggested format and language for park collection opening and closing procedures, access policies and procedures, and an agreement with a fire department. The sample documents are designed to cover all elements that normally need to be considered in most parks. You generally should follow the sample formats. However, the language may vary depending on your park's specific requirements and problems.

The electronic Museum Management Newsletter, issued by the NPS Museum Management Program, National Center for Cultural Resources Stewardship and Partnership publishes lists of park museum SOPs that are available upon request. Contact parks for copies of their SOPs. Some SOPs are available as WordPerfect files and can be furnished on disks or via cc:Mail either from the originating parks or your System Support Office (SSO).

3. *Where do I find additional help with preparing access policies and procedures?*

- **MH-II**, Appendix D, Museum Archives and Manuscript Collections
 - Section T. Providing Access to Archival and Manuscript Collections
 - Section U. Identifying Appropriate Restrictions for Archival and Manuscript Collections.
 - Section V. Implementing Access and Usage Policies for Archival and Manuscript Collections.
 - Section W. Monitoring and Tracking Researcher Use of Archival and Manuscript Collections
 - Figure D.16. Researcher Registration Form (Sample)
- **MH-I**, Chapter 6, Handling, Packing, and Shipping Museum Objects
 - Section C. General Rules for Handling Museum Objects

4. *Where do I find a sample visitor log?*

See Figure G.6 for a sample visitor log. An unpunched full size visitor log accompanies this appendix. Keep the full size visitor log as a master and make copies for your use.

<p>5. <i>Where do I find conditions for access to museum collections?</i></p>	<p>See Figure G.7 for conditions for access to museum collections. An unpunched full size conditions for access to museum collections accompanies this appendix. Keep the full size document as a master and make copies for your use.</p>
<p>E. Mandates and Requirements for Emergency Management for Museum Collections</p>	
<p>1. <i>What laws and regulations do I need to know?</i></p>	<p>Emergency preparedness is addressed in a number of Federal laws and regulations. The focus of these laws and regulations is on protecting visitors or on broad, general issues of park management and resource protection. See U.S. Code Citations: USC 12 & 17; 16 USC 1a-6, 1b-1, and 3; 28 USC 1346 & 2672; and 31 USC 6483; and 36 CFR 1.5.</p>
<p>2. <i>What do the NPS Management Policies tell me?</i></p>	<p><i>Chapter 5, Cultural Resource Management</i>, requires:</p> <ul style="list-style-type: none"> • <i>Emergency Management</i> [Page 5:14]: "The emergency operations plan for each park with cultural resources will address their protection or rescue in the event of an emergency or disaster." <p><i>Chapter 8, Use of the Parks</i>, outlines:</p> <ul style="list-style-type: none"> • <i>Emergency Preparedness and Emergency Operations</i> [Page 8:6]: "The National Park Service will develop a program of emergency preparedness in accordance with the Federal Civil Defense Act (50 USC 2251 et seq.), National Security Decision Directive 259 (Feb. 4, 1987), departmental policy, and other considerations at the Washington, region, and park levels. The purpose of the program will be to maximize visitor and employee safety and the protection of property. This program will include a systematic method for alerting visitors to potential disasters and evacuation procedures. <p>Superintendents may assist other agencies with emergencies outside parks. To the extent practicable, written agreements with such other agencies in accordance with the Federal Assistance and Interagency Agreements Guideline (NPS-20) must first be in effect. NPS employees who are outside the area of their jurisdiction and who are directed by their supervisors to provide emergency assistance to other agencies will be considered to be acting within the scope of their employment.</p> <p>NPS emergency operations will be conducted utilizing the Incident Command System (ICS) of the National Interagency Incident Management System (NIMS). Each park superintendent will develop and maintain an emergency operations plan to ensure an effective response to all types of emergencies that can be reasonably anticipated."</p>
<p>3. <i>What NPS guidelines do I need to know?</i></p>	<p><i>NPS-28, Cultural Resource Management Guideline</i>, is the general guideline for protecting and managing all cultural resources, including museum objects.</p>

- *Chapter 4* provides general guidance on including cultural resources in the Emergency Operation Plan (EOP).
 - *Chapter 9* states that the needs of collections are incorporated in emergency operation plans and that EOPs identify protection and recovery priorities for the most significant objects in the collection.
4. *What are the NPS standards for museum emergency management?*
- Identify all disasters and other emergencies that could cause damage to or loss of the museum collection, in whole or in part.
 - Include in the EOP a description of methods for protecting collections in time of emergency or write a separate museum emergency plan that describes such methods.
 - Identify methods to mitigate against disaster-related damage, to the extent possible, and develop procedures for responding to and recovering from damages resulting from events that cannot be mitigated against.
 - Stockpile emergency materials for use during and after a disaster and take other appropriate preparedness measures in anticipation of emergencies.
 - Prioritize in the EOP museum objects according to their value and importance. Ensure that following a disaster, the most valuable or significant objects are given highest priority for emergency treatment.
 - Ensure that secure on-site or off-site storage is available for protecting collections if regular storage or exhibit space becomes unusable following a disaster. Keep arrangements for the emergency use of non-NPS space such as freezer plants, current at all times.
 - Establish cooperative or other agreements with local law enforcement, civil defense, and emergency response agencies, with other governmental and non governmental agencies, and with nearby NPS units regarding mutual aid in time of disaster.

F. Glossary

- **Air Sampling Smoke Detector:** A device that draws air through small diameter (generally less than 1/8") tubing into a detector unit that uses either the ionization, photoelectric, or cloud chamber principle to analyze the quantity of smoke or combustion products in the sample. (Also called **Early Warning** or **Very Early Warning** detectors.)
- **Arson:** The malicious burning of or attempt to burn property. Generally, an entire building will be affected rather than specific objects or property contained within.
- **Automatic Sprinkler System:** A network of overhead pipes with spaced outlets (sprinkler heads) that open at a predetermined temperature to discharge water onto a fire.
- **Barriers:** Tools for physical security designed to prevent, restrict, or delay access to a protected area or object.

- **Burglary:** Breaking and entering with the intent to commit a felony, usually theft, although vandalism also is common.
- **Capacitance Motion Detector:** A motion detector designed to detect motion close to a protected object, generally used to detect and discourage touching of high value exhibits, such as wall hangings or paintings. The device generates a capacitance field 4-6" from the protected object that detects any electrical conductor that enters the field.
- **Central Station:** A privately owned alarm monitoring system monitored by personnel who will report alarms to the police or fire department and to designated members of the staff of the protected site. A central station may be owned by the protected site (proprietary) or by a commercial business (commercial central station).
- **Civil Disturbances:** Disturbance of civil order and the peace. This activity may be organized or spontaneous; may be indiscriminate, involving the park as a consequence of its location, or discriminate, involving the park as a planned target; and may be a prelude to other criminal activity, especially vandalism and larceny and possibly robbery and assault.
- **Class A Fire:** A fire in ordinary combustibles (such as wood, paper, rubbish, and many plastics).
- **Class B Fire:** A fire in petroleum products, flammable gases and other flammable liquids (such as paints, thinners, and solvents).
- **Class C Fire:** A fire in energized electrical equipment and wiring, where the non-conductivity of the extinguishing agent is important.
- **Contact Switch:** A normally open or normally closed electrical switch that triggers an alarm when the switch changes position. Examples include magnetic door and window contacts, plunger switches, and roller or ball switches.
- **Crime Prevention:** Anticipating, recognizing, and appraising the risk of a crime and initiating actions to remove or reduce the risk.
- **Cycling Sprinkler System:** A sprinkler system similar to a **Preaction System**, except that a separate heat detection system both opens and closes the control valve at predetermined temperatures. After the valve closes, if the fire rekindles, it reopens and water again flows from the opened heads. The valve will continue to open and close in accordance with the temperature sensed by the heat detection system.
- **Dry Pipe Sprinkler System:** A sprinkler system used in areas where temperatures below 32° F are expected. Pipes are filled with air or nitrogen under pressure. When fire opens a sprinkler head, air pressure in the system drops, releasing a valve, letting water flow into pipes and discharge from the open sprinkler(s).
- **Dual Technology Motion Detector:** A motion detector that combines two detection technologies (such as microwave/passive infrared or ultrasonic/passive infrared) to minimize unwanted alarms. Both technologies must detect motion before the device signals an alarm.
- **Duress Alarm:** A personal protection device (also known as a panic or hold-up alarm) consisting of a manually operated switch that triggers a local or remotely monitored alarm to summon assistance.
- **Embezzlement:** Appropriating fraudulently to one's own use or benefit property entrusted to one's care. The property stolen might be sold (fenced) or retained for the personal use of the embezzler.

- **Fire Protection Survey:** A survey of fire prevention and personnel training programs, structural and procedural fire hazards, maintenance of protective systems, and overall effectiveness of the fire protection program.
- **Flame Detector:** Device that detects radiant energy (such as infrared, ultraviolet, or both) that may or may not be visible to the human eye, such as glowing embers or coals, as well as flames.
- **Glass Break Detector:** Device that detects breaking glass. There are two types: frequency discriminators and metallic foil or wire. **Frequency Discriminators** detect the high frequency sounds generated when glass breaks. **Metallic Foil or Wire** is a ribbon of lead foil or small wire that carries an electrical current. It is attached to the glass around the perimeter of a window so when the glass breaks, the foil or wire breaks, breaking the electrical circuit, causing an alarm.
- **Heat Detectors:** Heat-responsive devices either of the spot or line type, designed to respond when the operating element reaches a predetermined temperature (**Fixed Temperature**), when the temperature rises at a rate exceeding 15°F per minute (**Rate-of-Rise**), or when the temperature of the air surrounding the device reaches a predetermined level, regardless of the rate of temperature rise (**Rate Compensation**). Some have both fixed temperature and rate-of-rise features.
- **Industrial Disasters:** Involves an explosion, structural collapse, hazardous materials release, fire, a major accident, nuclear incident, major power outage or utility loss, and a serious break in water, sewer, or gas line.
- **Ionization Detectors:** A device that detects small combustion particles generated in the flame stage of a fire.
- **Larceny:** Unlawful taking or stealing of property or articles of value without the use of violence or fraud. There is a presumption that the property was not entrusted to the care of the person committing the theft. A presumption of theft also can be raised by possession of recently stolen property.
- **Line-Type Heat Detector:** A heat sensitive wire or tube, which triggers an alarm when the temperature in the protected space increases at a rate of 15°F, or greater, in a minute.
- **Line-Type (Photoelectric Beam) Smoke Detector:** A device that projects a beam of light (in the infrared range) to a receiver across an open area. The receiver measures light diffraction to detect smoke. These detectors often are used to protect large gallery-type spaces with high ceilings.
- **Local Alarm System:** A fire or intrusion detection system that causes an audible or visual alarm at the protected site, but which is not monitored off-site.
- **Magnetic Contact:** A detection device that uses a magnet mounted on a movable surface to open or close a contact switch mounted on a fixed surface.
- **Microwave Motion Detector:** A device that transmits electromagnetic energy in the microwave range (radar). The device measures the amount of energy reflected back to it and detects motion based on the doppler effect (a frequency shift that occurs as an object moves toward or away from the detector).
- **Natural Catastrophe:** Involves an earthquake, volcanic eruption, landslide, flood, hurricane, tornado, tidal wave, lightning, or wildfire.
- **On-Off Sprinkler Head:** A sprinkler head used on a standard wet-pipe system that makes the system act like a **Cycling Sprinkler System**. The difference is that each individual sprinkler head contains a temperature-sensitive device that opens the head at a predetermined temperature and closes it automatically.

when the temperature falls to a preselected point. Systems with on-off sprinkler heads operate independently of the fire alarm system.

- **Passive Audio or Sonic Sensors:** Audio and sonic sensors detect sound. An **Audio Sensor** is a sound activated microphone that transmits sounds from the protected space to a loud speaker in the monitoring station so the person monitoring the sensor hears what is going on in the protected space. **Sonic Sensors** are frequency discriminators that detect sound in the frequency range associated with movement.
- **Passive Infrared Motion Detector (PIR):** A device sensitive to infrared heat in the range generated by the average human body. The detector transmits no energy, but uses a series of heat sensitive elements to cover the protected area in a pattern of zones resembling the fingers on a hand. The device detects motion when a heat source moves from one detection zone to another. Everything has an infrared signature, and many mimic that of the human body (for example, a large animal or a radiant heater).
- **Photoelectric Beam Motion Detector:** A device with a transmitter that projects a beam of infrared light across an open space to a receiver. The receiver may be located directly across from the transmitter, or the light beam can be directed around the room with a series of small mirrors. Photoelectric beam devices may use just one beam or, to minimize unwanted alarms, several beams (stacked array).
- **Photoelectric Detector:** A device that detects large combustion particles in visible smoke.
- **Physical Security:** All measures intended to prevent acts of violence against persons and destructive or unauthorized access to, or removal of, property.
- **Preaction Sprinkler System:** A type of dry pipe sprinkler system with the water supply controlled by a fire detection system (either smoke or heat detection) wired so an alarm opens a valve to let water flow into the system piping. After the supply valve opens, the preaction system operates like a wet-pipe system.
- **Pressure Mat:** A pressure-sensitive mat, usually placed under a rug or carpet, to detect an intruder stepping into the protected space.
- **Probability:** The likelihood of a threat becoming an actual loss event.
- **Risk:**
 - **Conventional Risk:** A condition that entails both the possibility of loss and gain, such as investing in the stock market.
 - **Pure Risk:** A condition that is loss-only oriented. Among the pure risks that threaten park assets are crimes, natural disasters, civil unrest, and accidents.
- **Risk Assumption:** Using existing resources to absorb losses as and when they occur.
- **Risk Management:** The process of identifying, evaluating, and eliminating as many risks as possible by selecting and implementing effective countermeasures.
- **Risk Transfer:** The process of transferring a risk to another entity for a fee. A known cost, such as an insurance premium, may be substituted for the chance of a greater loss.
- **Robbery:** Theft by violence or threat of violence to one's person. Also included under this heading is the taking of a hostage to force someone on the museum staff to open the building or a secure area within the building.

- **Security:** Security includes all techniques, procedures, equipment and planning intended to prevent loss of or damage to collection objects from criminal activity, negligence, fire, or other catastrophic events.
- **Security Survey:** The National Institute of Law Enforcement and Criminal Justice describes the security survey as "a critical on-site examination and analysis of an industrial plant, business or home, public or private institution to ascertain the present security status; to identify deficiencies or excesses; to determine the protection needed; and to make recommendation to improve the security."
- **Severity:** The impact or effect upon the assets or upon the organization if a loss does occur.
- **Shoplifting:** A specific type of larceny that involves theft of merchandise for sale. This threat is a concern when there are sales operations within the park.
- **Spot-Type Smoke Detector:** A device that detects products of combustion by either the ionization or photoelectric principle, covering a defined area (generally no more than 900 square feet per detector in an open space with ceiling height less than 15 feet).
- **Standpipe System:** A piping system in a building to which hoses are connected for emergency use by building occupants or by the fire department. Standpipe systems intended for fire department use normally do not have hoses permanently attached; responding fire personnel provide the hose and use the standpipe connection to reduce the amount of hose they must carry into the building. Such systems may be charged with water by fire department pumpers. Standpipe systems intended for occupant use will have hoses, usually 1½ inches in size, already attached. Such systems usually are permanently charged with water.
- **Strain Sensor:** A device that detects the distortion that occurs on the under side of a joist, floor, or platform when weight is applied to the top surface.
- **Threat:** A potential to inflict harm or cause damage or loss.
- **Ultrasonic Motion Detector:** Similar to the microwave motion detector, except the device uses high frequency acoustic (sound) energy that will not penetrate solids.
- **Vandalism:** Willful or malicious destruction or defacement of objects, exhibits, or structures. This crime may be random and indiscriminate or directed toward a particular object, building, or exhibit. Vandalism is called sabotage if committed to hinder operations.
- **Vibration or Shock Detector:** A device that attaches directly to a protected object, an exhibit platform, or the structure of an exhibit case, which detects vibration, such as might occur when someone moves the protected object or strikes the protected exhibit case.
- **Warded Lock:** A lock with gates to which the correct key aligns to allow movement of the bolt and with internal wards, or obstructions, that block the entry or turning of an incorrect key.
- **Wet Pipe Sprinkler System:** A sprinkler system in which the piping permanently contains water.

G. List of Figures

Figure G.1	Sample Scope of Work for a Security Survey	G:15
Figure G.2	Sample Scope of Work for a Fire Protection Survey	G:20
Figure G.3	Sample Furnished Historic Structure Opening and Closing Procedures	G:25
Figure G.4	Sample Museum Collections Storage Opening and Closing Procedures	G:28
Figure G.5	Sample Park Museum Collection Access Policy and Procedures	G:29
Figure G.6	Sample Visitor Log	G:32
Figure G.7	Conditions for Access to Museum Collections	G:33
Figure G.8	Sample Memorandum of Understanding Between a Park and a Fire Company	G:34

SCOPE OF WORK
Museum Security Survey
[Park Name]

Purpose of Work

The work consists of conducting a museum security survey of the [facility/ facilities] described below. There are two purposes for the survey. The first is to reveal and identify weaknesses in existing protection systems, equipment, procedures, policies, and operations that could result in the loss of such museum resources as collections, collection records, and exhibits, as well as the museum [structure/structures] [itself/themselves]. The second purpose is to identify alternatives to correct any weaknesses or deficiencies that may be found. The ultimate goal of performing the survey[s] and of implementing corrective actions is protecting museum property against all forms of losses.

Description of Site[s] to be Surveyed

[Here describe the buildings--visitor center, furnished historic structure, storage facility--to be surveyed. Characterize it/them in terms of location, size, functions, construction, and nature of contents. Provide whatever information is deemed necessary for the contractor to have in advance. In particular, indicate the nature of exhibits to be surveyed, making clear whether they are conventional exhibits or furnished rooms or both. In most cases, the Scope of Work (SOW) statement will become part of the request for proposal sent out to prospective contractors. It is important that prospective contractors have sufficient information about the site and facilities to be surveyed to permit them to make responsive proposals. You may wish to attach more detailed information, such as park brochures, to the SOW to avoid having to put a lot of detail in this section.]

Scope of Work

The Contractor will survey the structures or facilities described above, identify security weaknesses and deficiencies, and make recommendations for their correction in a separate formal report. *[If more than one park is involved, you should request a separate report for each park. Only rarely might you specify a separate report for each structure in the same park.]* The Contractor will visit and survey operations and conditions at [the site/each site] for [number of days]. In addition, the Contractor will return to [the site/each site] an additional one-half day to orally present his/her findings and recommendations to the site staff[s]. After completion of the return visit, the final report[s] will be revised as necessary based on comments made during the oral presentation and submitted to the park.

In carrying out this work, the Contractor will perform at a minimum the following tasks:

1. Prior to identifying himself/herself to the staff, tour public spaces in each of the specified facilities as an ordinary visitor and observe conditions and activities affecting protection of the collections and the structures. *[If visitors normally have to pay a fee for admission to the site, indicate in this paragraph that fees paid will constitute a cost-reimbursable expense.]*
2. Meet with management and staff at each site including *[Here specify by title each of the site staff that the contractor must meet. At a minimum, the contractor should meet with the superintendent, the chief ranger, and the park curator.]* *[At each site other/Other]* staff may be interviewed as deemed appropriate by the local manager or necessary by the Contractor and as may be arranged by the local staff.

Figure G.1. Sample Scope of Work for a Security Survey

3. Evaluate the physical security of each building in both public and non-public areas. Note problems with perimeters, including doors, windows, air intakes, roof hatches, and other penetrations. Evaluate perimeter lighting, locks, hardware, hinges, and other security equipment and devices. Evaluate the ease with which someone could penetrate the perimeter with or without being detected. Observe and evaluate perimeter security during the daytime and after dark. Before conducting surveys after hours, inform the local superintendent or site manager of when and how they will be carried out; that will preclude harm to the Contractor or site staff and ensure cooperation of staff on the night shift.
4. Examine and evaluate the electronic alarm systems, including controls, detectors, exhibit case sensors, panic devices, alarm and signaling devices, remote monitoring equipment, remote alarm transmission media (including line supervision), and other pertinent components. Test the proper functioning of the systems and evaluate their operation and maintenance. Evaluate [contract/proprietary] central station services (monitoring, response, premises security, and maintenance support).
5. Examine security staffing for adequacy. Review staffing levels, position descriptions, performance standards, standard operating procedures, training, and delegations of responsibility for all personnel and staff components directly responsible for museum security. Evaluate protection of all areas by security personnel. Review the scheduling and conduct of security patrols. Evaluate adequacy of protection provided by interpreters during interpretive tours or programs. Evaluate the interpretive operations plan in respect to how well it incorporates security concerns into the responsibilities of interpreters. If guards are used on the night shift, evaluate their effectiveness and response capabilities and the extent to which they may be vulnerable to personal injury, attack, or accident during their rounds.
6. Evaluate security training or security awareness programs provided at the site for both security and non-security personnel.
7. Evaluate policies for and staff compliance with access and parcel controls in use at the site[s], particularly in office and work areas, in exhibit areas, and in collections storage.
8. Evaluate security policies and procedures, including standard operating procedures, delegations of authority, and memoranda of agreement or understanding with local police and emergency agencies.
9. Evaluate key control and retrieval. Evaluate the adequacy of locking systems, key documentation, and key security. Determine whether card access or similar control systems would be appropriate and practical for securing or controlling access to buildings and to high-security areas, such as collections storage.
10. Evaluate internal security programs, particularly procedures to account for objects taken outside of collection storage and exhibit areas, such as in offices and workrooms or in transit.
11. Evaluate security for objects on exhibit and in storage, including case design, security hardware, detection systems, locks, keying, accountability procedures, and other internal control procedures and systems. In particular, evaluate the ease with which objects may be stolen from exhibits [and furnished rooms] without immediate detection of the act. Evaluate the ease with which objects on exhibit [and in furnished rooms] may be vandalized, with or without immediate detection.

Figure G.1. Sample Scope of Work for a Security Survey (continued)

12. *[This paragraph is needed only when historic structures are to be surveyed.]* All recommendations for improvements to or replacements of systems and hardware will take into account and be sensitive to the historic nature of the structure[s]. As appropriate, alternative recommendations for equipment and/or installation techniques will be made to allow for maximum preservation of historic fabric.
13. Evaluate the timeliness, effectiveness, and accuracy of how the [site/sites] report[s] criminal or other incidents involving collections.
14. Observe and comment on other security problems that may be noted during the survey[s]. Evaluate park policies and documentation for all security procedures not otherwise specified above.

Standards

The following published documents shall be considered the standards against which Contractor shall evaluate security at the site[s]. The first [qty] items are available for loan to Contractor upon request. The remaining items are standard industry publications which should already be available to Contractor.

[Here list relevant documents, such as: NPS Museum Handbook, Part I; NPS-28 "Cultural Resource Management Guideline"; NPS-44 "Personal Property Management Guideline"; NPS-50 "Loss Control Management Guideline"; NPS Management Policies; Special Directive 80-1 and NPS Checklist for Preservation and Protection of Museum Collections; and any other NPS documents that may be relevant. List the American Society for Industrial Security (ASIS) Suggested Guidelines in Museum Security; and other industry publications.]

Protection of Information

All information and documentation gathered or produced by the Contractor during the course of this work shall be held in strictest confidence and shall be fully protected from access by unauthorized persons. Any documentation furnished by the site[s] and retained by the Contractor during the course of the work or thereafter shall be secured in a locked filing cabinet or safe at a minimum. During the initial visit to the site[s], the Contractor shall indicate to the superintendent[s] the manner in which he/she intends to secure any documentation the site[s] may furnish; the superintendent[s] will have the prerogative to specify when more stringent security must be provided for any particular documentation furnished to the Contractor. Documentation that cannot be secured to the superintendent's[s'] satisfaction still will be furnished to the Contractor, but only for on-site use.

Notes and other information produced by the Contractor, including all versions and copies of his/her report and any drawings that may be produced, shall be secured in a locked filing cabinet or safe, at a minimum. Word processor and other computer files shall be secured in an equivalent manner, such as by retaining files only on diskettes kept in a safe, rather than on a hard drive, and by the use of passwords or encryption. During the initial visit to the site[s], the Contractor shall indicate to the superintendent[s] the manner in which he/she intends to secure computer data generated during the course of the work; the superintendent[s] will have the prerogative of specifying that additional security measures be taken whenever circumstances so dictate.

Figure G.1. Sample Scope of Work for a Security Survey (continued)

Products, Deliverables, and Performance

1. Contractor should discuss his/her findings and recommendations with protection and museum staff at *[the/each]* site during the initial visit[s], and is encouraged also to discuss recommendations for corrective actions, but is not obliged to do so. Contractor has an ethical obligation to verbally point out serious protection weaknesses as they are encountered, if such weaknesses could, in his/her judgement, result in imminent loss of park resources.
2. Contractor shall prepare and submit a written report of survey *[for each site visited]*. The report shall present findings and recommendations for each applicable subject listed above in the Scope of Work and shall be organized in a logical, easily comprehended manner. *[The/Each]* report shall include an executive summary, a discussion of observations and problems (organized according to areas within *[the/each]* structure or according to each security issue, e.g., training, staffing, and hardware), a list of recommendations and possible alternative solutions for problem areas, a comprehensive prioritized list of recommendations, a list of recommended suppliers of security hardware and systems and cut sheets or other manufacturer's literature on recommended hardware or system components, and a bibliography of recommended readings on the specific protection problems and solutions presented in the report[s].
3. Submit draft reports to the park according to the schedule below. Reports will be reviewed promptly and returned with comments. Contractor will be expected to incorporate each comment into the report or be prepared to explain why doing so is not appropriate.
4. After approval of the second draft, return to *[the/each]* park for a followup visit. Orally present findings and recommendations to the assembled park staff. Orally respond to questions, comments, and concerns from the staff. *[The/Each]* presentation[s] should include a walk-through of the surveyed *[facility/facilities]* as necessary to make findings and recommendations clear. In order to ensure sufficient time for the presentation[s], *[it/they]* should be scheduled to allow for one-half day *[per site]*.

Time for performance is *[number of months]*. *[The]* Initial site visit[s] must be completed within *[number of days]* from award of contract. The final report must be completed within *[number of days]* after completion of the initial visit[s]. *[The following schedule of completion is suggested. Modify as instructed by your contracting officer.]*

<u>Work Element</u>	<u>Completion Time After Award</u>
Initial site visits	<i>[number of days]</i>
Submit first draft of report[s] to park	<i>[number of days]</i>
Correct report[s] by Contractor	at Contractor's discretion
Submit second draft of report[s] to park	<i>[number of days]</i>
Correct report[s] by Contractor	at Contractor's discretion

Figure G.1. Sample Scope of Work for a Security Survey (continued)

<u>Work Element</u>	<u>Completion Time After Award</u>
Followup site visit[s] and present report[s] to park staffs	[<i>number of days</i>]
Complete final report[s]	at Contractor's discretion
Submit final report[s] to park staffs	[<i>number of days</i>]

Schedule of Partial Payments

Partial payments will be made upon successful completion of each successive phase of the work, as outlined below:

Initial site visit[s]	50%
Submit second draft[s] of report[s]	25%
Submit final report[s]	25%

Inspection and Acceptance

[*Insert Name and Title*] shall serve as the Contracting Officer's Technical Representative (COTR) on this project. The COTR is empowered to inspect and evaluate all work of this Contract for compliance with terms of this Scope of Work Statement.

Acceptance of the work of this contract and any changes to the terms of this contract shall be made in writing only by the Contracting Officer.

Figure G.1. Sample Scope of Work for a Security Survey (continued)

SCOPE OF WORK
Fire Protection Survey
[Park Name]

Purpose of Work

The work consists of conducting a museum fire protection survey of the [facility/ facilities] described below. There are two purposes for the survey. The first is to reveal and identify weaknesses in existing protection systems, equipment, procedures, policies, and operations that could result in the loss of such museum resources as collections, collection records, and exhibits, as well as the museum [structure/structures] [itself/themselves]. The second purpose is to identify how to correct any weaknesses or deficiencies that may be found. The ultimate goal of performing the survey[s] and of implementing corrective actions is the protection of museum property against all forms of losses due to fire or to fire fighting activities.

Description of Site[s] to be Surveyed

[Here describe the buildings--visitor center, furnished historic structure, storage facility--to be surveyed. Characterize it/them in terms of location, size, functions, construction, nature of contents. Provide whatever information is deemed necessary for the contractor to have in advance. In particular, indicate the nature of exhibits to be surveyed, making clear whether they are conventional exhibits or furnished rooms or both. In most cases, the scope of work (sow) statement will become part of the request for proposal sent out to prospective contractors; it is important that prospective contractors have sufficient information about the site and facilities to be surveyed to permit them to make responsive proposals. You may wish to attach more detailed information, such as park brochures, to the SOW to avoid having to put a lot of detail in this section.]

Scope of Work

The contractor will survey the structures or facilities described above, identify fire prevention, detection, and suppression weaknesses and deficiencies, and make recommendations for their correction in a separate formal report. *[If more than one park is involved, you should request a separate report for each park. Only rarely might you specify a separate report for each structure in the same park.]* The contractor will visit and survey operations and conditions at [the site/each site] for [number of days]. In addition, the contractor will return to [the site/each site] an additional one-half day to orally present his/her findings and recommendations to the site staff[s]. After completion of the return visit, the final report[s] will be revised as necessary based on comments made during the oral presentation and submitted to the park.

In carrying out this work, the contractor at a minimum will perform the following tasks:

1. Meet with management and staff at each site including *[Here specify by title each of the site staff that the contractor must meet. At a minimum, the contractor should meet with the superintendent, the chief ranger, the chief of maintenance, the structural fire coordinator, and the park curator.]* *[At each site other/Other]* staff may be interviewed as deemed appropriate by the local manager or as necessary by the Contractor and as may be arranged by the local staff.
2. Evaluate fire prevention policies, programs, and procedures in each building in both public and non-public areas. Examine existing policies and the extent to which they are appropriate to the resources being protected and actually are being followed. Examine the effectiveness of programs and procedures in preventing fires from starting.

Figure G.2. Sample Scope of Work for a Fire Protection Survey

3. Examine and evaluate fire detection and alarm systems, including sensors and detectors, manual pull stations, water flow and position indicating alarms, system controls, standby power, alarm and signaling devices, remote monitoring and annunciation equipment, remote alarm transmission media (including line supervision), and other pertinent components. Determine the extent to which systems comply with current National Fire Protection Association (NFPA) standards for the installation, operation, maintenance, and testing of fire alarm signaling systems (NFPA 72, National Fire Alarm Code). Report on the extent to which system components are listed by Underwriters Laboratories (UL). Test the proper functioning of the systems and evaluate their operation and maintenance. Evaluate [*contract/proprietary*] central station services (monitoring, response, premises security, and maintenance support).
4. Examine and evaluate the types, sizes, locations, etc. of hand-held fire extinguishers currently in use in the [*facility/facilities*] being surveyed. Determine whether different types or sizes would be more appropriate and whether existing extinguishers should be relocated or augmented with additional extinguishers. When extinguishers are concealed for aesthetic reasons, determine whether concealment poses the potential for such problems as delayed access or failure to use an otherwise available extinguisher. Evaluate procedures, programs, and schedules for testing fire extinguishers; determine whether proper records are created and maintained when extinguishers are tested.
5. Examine and evaluate the appropriateness, capacity, spacing, temperature rating, and hazard rating of fixed sprinkler systems. Examine and evaluate hose and standpipe systems inside the [*facility/facilities*] being surveyed. Examine and evaluate the suitability and locations of fire hydrants near the [*facility/facilities*] being surveyed. Determine whether different types or sizes of automatic and manual suppression systems would be more appropriate and whether additional units are required. Determine if water supplies provide the necessary flow rate and volume. Examine the maintenance and protection of fire department connections and the protection of water supply control valves.
6. Examine the adequacy of current staff in respect to their ability to prevent, detect, respond to, and suppress fires. Review staff size, position descriptions, performance standards, standard operating procedures, training, and delegations of responsibility for all personnel and staff components directly responsible for any aspect of fire protection. Determine the adequacy of fire patrols and of those aspects of facility closing procedures that are intended to prevent after hours fires. Evaluate adequacy of protection provided by interpreters during interpretive tours or programs. Evaluate the interpretive operations plan in respect to how well it incorporates fire prevention or awareness concerns into the responsibilities of interpreters. If guards or patrols are used at night, evaluate their effectiveness and the extent to which they are able to detect fires and provide or summon appropriate response.
7. Evaluate training provided to the [*site's/sites'*] fire brigade[s] and general staff fire protection awareness programs provided at the [*site/sites*]. Determine whether the right staff are being trained. Determine the extent to which training requirements of NPS-58, Structural Fire Guideline, Chapter 7, are being met. In particular, examine training in the use of hand-held fire extinguishers and fire hoses.
8. Evaluate fire suppression policies and procedures, including standard operating procedures, delegations of authority, and memoranda of understanding with local fire and emergency agencies for fire inspection or suppression services. Memoranda must comply with NPS-58 and with applicable federal regulations.

Figure G.2. Sample Scope of Work for a Fire Protection Survey (continued)

9. Evaluate pre-fire planning and the extent to which such planning is in accordance with NPS-58, Chapter 6. In particular, examine whether pre-fire planning takes into account the special needs of museum objects, records, exhibits, storage areas, and work spaces, as noted on pages 1 and 3 of Chapter 6. Also determine whether pre-fire planning strikes a proper balance between protecting museum resources and the structures housing them. *[When historic structures are involved, you may wish to strengthen this paragraph by adding the issue of protecting historic structures themselves.]*
10. Determine quality of the structural fire inspection programs and extent of compliance with NPS-58, Chapter 5.
11. Evaluate the timeliness, effectiveness, and accuracy of post-fire investigation and reporting. Evaluate reporting in terms of requirements set forth in NPS-58, Chapters 11 and 12.
12. *[This paragraph is needed only when historic structures are to be surveyed.]* All recommendations for improvements to or replacements of systems and hardware will take into account and be sensitive to the historic nature of the structure[s]. As appropriate, alternative recommendations for equipment and/or installation techniques will be made to allow for maximum preservation of historic fabric.
13. Observe and comment on other fire protection problems that may be noted during the survey[s]. Evaluate park policies and documentation for all fire prevention, detection, and suppression procedures not otherwise specified above.

Standards

The following published documents must be considered the standards against which Contractor shall evaluate security at the site[s]. The first *[qty]* items are available for loan to Contractor upon request. The remaining items are standard industry publications which should already be available to Contractor.

[Here list relevant documents, such as: NPS Museum Handbook, Part I; NPS-28, Cultural Resources Management Guideline; NPS-58, Structural Fire Guideline; NPS Management Policies; Special Directive 80-1 and NPS Checklist for Preservation and Protection of Museum Collections; and any other NPS documents that may be relevant. List National Fire Protection Association (NFPA) and Factory Mutual (FM) guidelines; fire protection industry publications.]

Products, Deliverables, and Performance

1. Contractor should discuss his/her findings and recommendations with administrative and resources management staff at *[the/each]* site during the initial visit[s], and is encouraged to also discuss recommendations for corrective actions. Contractor has an ethical obligation to verbally point out serious protection weaknesses as they are encountered, if such weaknesses could, in his/her judgement, result in imminent loss of park resources.
2. Contractor shall prepare and submit a written report of survey *[for each site visited]*. The report shall present findings and recommendations for each applicable subject listed above in the Scope of Work and shall be organized in a logical, easily comprehended manner. *[The/Each]* report shall include an executive summary, a discussion of observations and problems (organized according to areas within *[the/each]* structure or according to each fire protection issue, e.g., training, staffing,

Figure G.2. Sample Scope of Work for a Fire Protection Survey (continued)

hardware), a list of recommendations and possible alternative solutions for problem areas, a comprehensive prioritized list of recommendations, a list of recommended suppliers of fire protection hardware and systems and cut sheets or other manufacturer's literature on recommended hardware or system components, and a bibliography of recommended readings on the specific protection problems and solutions presented in the report[s].

3. Submit draft reports to the park according to the schedule below. Reports will be reviewed promptly and returned with comments. Contractor will be expected to incorporate each comment into the report or be prepared to explain why doing so is not appropriate.
4. After approval of the second draft, return to *[the/each]* park for a followup visit. Orally present findings and recommendations to the assembled park staff. Orally respond to questions, comments, and concerns from the staff. *[The/Each]* presentation[s] should include a walk-through of the surveyed *[facility/facilities]* as necessary to make findings and recommendations clear. In order to ensure sufficient time for the presentation[s], *[it/they]* should be scheduled to allow for one-half day *[per site]*.

Time for performance is *[number of months]*. *[The]* Initial site visit[s] must be completed within *[number of days]* from award of contract. The final report must be completed within *[number of days]* after completion of the initial visit[s]. *[The following schedule of completion is suggested. Modify as instructed by your contracting officer.]*

<u>Work Element</u>	<u>Completion Time After Award</u>
Initial site visits	<i>[number of days]</i>
Submit first draft of report[s] to park	<i>[number of days]</i>
Correct report[s] by Contractor	at contractor's discretion
Submit second draft of report[s] to park	<i>[number of days]</i>
Correct report[s] by Contractor	at contractor's discretion
Followup site visit[s] and present report[s] to park staffs	<i>[number of days]</i>
Complete final report[s]	at contractor's discretion
Submit final report[s] to park	<i>[number of days]</i>

Figure G.2. Sample Scope of Work for a Fire Protection Survey (continued)

Schedule of Partial Payments

Partial payments will be made upon successful completion of each successive phase of the work, as outlined below:

Initial site visit[s]	50%
Submit second draft[s] of report[s]	25%
Submit final report[s]	25%

Inspection and Acceptance

The *[Insert Name and Title]* shall serve as the Contracting Officer's Technical Representative (COTR) on this project. The COTR is empowered to inspect and evaluate all work of this Contract for compliance with terms of this Scope of Work Statement.

Acceptance of the work of this contract and any changes to the terms of this contract shall be made in writing only by the Contracting Officer.

Figure G.2. Sample Scope of Work for a Fire Protection Survey (continued)

NATIONAL PARK SERVICE

[Park's Name]

To: All Park Personnel

From: Superintendent

Subject: Opening and Closing Procedures for [Structure's Name]

Purpose: To establish responsibilities for security and daily opening and closing procedures of [Structure's Name].

Policy: Park personnel assigned to [Structure's Name] will follow established guidelines to ensure proper security of the site and protection of the resource.

Guidelines:

The intrusion detection system will be activated during all non-business hours. Generally this is from 4:30 PM to 7:30 AM daily. Hours may vary slightly on weekends.

On days when it is not open to the public, the Curator is responsible for arming the intrusion detection system at the end of the workday. On days when the furnished historic structure is open to the public, it is the responsibility of the interpretive staff to arm the system. Generally the furnished historic structure is open on weekends and [days] during the summer.

Each morning, it is the responsibility of the Park Ranger staff to disarm the intrusion detection system. The guards on duty will turn off the systems during the early morning patrol at about [Time].

It is the responsibility of the Curator and custodian to maintain security on days when the house is not open to the public. Exterior doors should remain locked at all times and the house should be secured and alarmed at the end of each workday.

It is the responsibility of the Interpretive staff to secure the structure on weekends and on other days that the furnished historic structure is open to the public. The closing procedures should include inspecting the entire furnished historic structure, not just the areas used by the public.

The evening ranger patrol will include an inspection to ensure that the structure has been properly secured. Before entering, the park ranger will patrol around the exterior of the furnished historic structure shining the flashlight on each of the windows to ensure that they are closed. Only if all appears secure, will the ranger enter the structure alone to complete the inspection.

Closing Procedures:

The following steps are taken by designated interpretive or museum staff. As you walk through the house, note maintenance or safety concerns or questions about museum object security.

1. Ensure that visitors are out of the house. Record tour and visitation statistics when the house has been open to the public.

Figure G.3. Sample Furnished Historic Structure Opening and Closing Procedures

2. Place the moveable "entrance" signs inside the Conservatory when the house has been open to the public.
3. Lock all exterior doors. Exterior doors are located in:
 - Conservatory (2 doors)
 - Front entrance
 - Atrium or Small Conservatory
 - Den
 - Kitchen Pantry Hall
 - Servants' Hallway
4. Close all windows and fasten those that can be locked. Check windows in the Conservatory and on all three floors of the house.
5. Pull down the window shades as you check each window.
6. Put the two tripods with fire detectors in their proper position in the Foyer and the Dining Room. Poles should be extended so the detector heads are as close to the ceiling as possible.
7. Close the following interior doors:
 - Front double doors (dead-bolted top & bottom & chained)
 - Basement electrical room
 - First floor Servants' Hall door to Basement
 - Second floor hall door between Servants' Wing and Staircase (Intrusion alarm does not arm properly if they are open.)
 - Basement Furnace Room
 - Third floor door to Attic stairs
8. Close the following interior doors, if possible:
 - All basement room doors except fire control panel room
 - Both doors to China Storage area
 - Servants' Hall door to Front Foyer

(NOTE: Closing these doors reduces the chances for false alarms.)
9. Leave night lights on in the following areas:
 - Laundry Room, above the sinks
 - Kitchen, above the sink
 - Servants' Hall, above the radiator
 - Dining Room, one light on each of the two sconces
 - Entrance Hall, inner chandelier globe. (NOTE: The switch is in closet.)
 - Second floor Servants' Hall staircase
10. Activate the two intrusion detection system panels in the Laundry Room. Remember the Servants' Wing exit must be closed before the system is armed. Exit the house through the Servants' Wing door.
11. Make a final patrol around the outside of the house to check doors and windows. Do not jiggle doors or windows from the outside. (Doing so might cause an intrusion alarm.)

Figure G.3. Sample Furnished Historic Structure Opening and Closing Procedures (continued)

Opening Procedures:

Intrusion detection systems are disarmed each morning by the park ranger staff. The systems will be off prior to the time that other park staff need to enter the house.

1. Before entering, walk around the outside of the house and check for signs of entry. If anything looks suspicious do not enter. Report the observation to the protection staff immediately.
2. Enter through the Servants' Wing door. Lock the door behind you.
3. Check the status lamps and alarms on both alarm system panels in the Laundry Room and report any malfunctions.
4. Make a walk-through visual inspection of the entire house, including the basement and upper floors. Make particular note of signs of attempted entry, safety or maintenance needs, and the location of museum objects. Report concerns or problems to the appropriate protection or museum staff.
5. Take down the two portable fire detectors in the Foyer and Dining Room, when the house is open to the public. Place them in the Hall Closet.
6. Prepare the rooms along the tour route by opening shades and turning on the appropriate lights, if the house is to be open to visitors. Make a special note of safety and security concerns in these visitor use areas.
7. Prepare for greeting visitors by placing the entrance signs outside. Establish tour assignments, prepare the visitor statistic sheet and ensure that a supply of park folders is available.
8. In summer, when temperatures are hot, visitors will enter through the front door. When weather is cool, the Conservatory will be opened as a waiting area for visitors. If the Conservatory is to be opened, clean up the room, place literature out on display, and unlock both exit doors from the room.
9. Call the Park's Visitor Center desk to let them know that the house is ready for visitors and to check for any special tours or activities.
10. Throughout the day, be certain that all doors into the house are locked unless you can observe them. Generally, the only doors that should be unlocked during the day are those in the Conservatory when it is being used as a visitor waiting area.

Figure G.3. Sample Furnished Historic Structure Opening and Closing Procedures (continued)

NATIONAL PARK SERVICE

[Park's Name]

To: All Park Personnel
From: Superintendent
Subject: Opening and Closing Procedures for [Storage Facility's Name]

Purpose: To establish responsibilities for security, fire prevention and daily opening/closing procedures for the park's museum collection storage facility.

Policy: Park personnel who are assigned responsibility for the park's museum collection are required to follow the established guidelines to ensure the proper security of the site and protection of the resources.

Guidelines

Opening Procedures:

1. Before entering the facility, check for any unusual circumstances (e.g., signs of illegal entry, vandalism or maintenance problems). If anything looks suspicious **DO NOT ENTER**. Report any problems to the appropriate staff person in law enforcement, maintenance and/or supervisor immediately.
2. Unlock exterior doors. Turn off the intrusion detection system.
3. Turn on museum workspace lights.
4. Unlock collection storage space door (when needed) and turn on lights.
5. Inspect museum workspace and collection storage space for unauthorized entry, fire hazards, or other unusual happenings (such as roof leaks, fire suppression system leaks, pests, and damaged objects).

Closing Procedures:

1. Inspect the collection storage space to be sure all museum objects and associated records are returned to their proper locations; dust covers are in place; all storage cabinets are closed and locked, and that all tools, equipment, reference books have been returned to their proper places.
2. Check that all museum storage cabinets that were used during the day are locked. Return all storage cabinet keys to keybox and secure it.
3. Check the workspace and collection storage space to be sure that all staff or any other persons are out of the facility.
4. Turn off lights. Make sure that collection storage space door is locked.
5. Turn off all computer equipment, other electrical equipment, and lights in adjacent office spaces.
6. Lock windows in office spaces.
7. Turn on the intrusion detection system.
8. Lock exterior doors.

Figure G.4. Sample Museum Collections Storage Opening and Closing Procedures

NATIONAL PARK SERVICE

[*Park's Name*]

To: All Park Personnel

From: Superintendent

Subject: Museum Collection Access Policy and Procedures

Purpose: To establish park policy and procedures for access to the museum collection. It is the policy of the National Park Service, and of [*Name of Park*], that its natural and cultural resources shall be made available for educational and research purposes, as long as this access doesn't:

- endanger the item's preservation and security
- conflict with Federal legislation (such as the Copyright Act, the Freedom of Information Act) or state legislation (such as privacy and public laws)

NPS museum collections possess internal administrative importance, as well as importance to educational, research, and publishing communities both inside and outside the Service. Protecting these valuable resources, while making them available to the widest possible audience, requires the park museum staff to manage access to the museum collection.

Times of Operation: Normal hours of access to the park's museum collection are [*Days and Hours*].

General Access Procedures:

1. Except as otherwise noted, this written procedural statement applies equally to museum objects, archival and manuscript materials, museum collection records, and information about such park resources prepared by the staff in the course of their official duties.
2. Access to objects in the collection, to storage cabinets and exhibit cases, and to keys to locks on storage rooms, storage cabinets, and exhibit cases, will be strictly controlled by the Superintendent or designee. These areas shall be designated as secure areas, and except for emergencies, access shall be limited to authorized park staff. Park staff are discouraged from routinely using museum storage space as work or reference room space.
3. Only those persons authorized in writing by the superintendent (authorized park staff) will be permitted unaccompanied access to secure areas, including museum storage, work, and reference/study room spaces, under normal conditions. All other persons must be accompanied by authorized staff while in a secure area. In an emergency, designated emergency response personnel may have access to secure areas in accordance with the provisions of the park's Emergency Operations Plan. An authorized person will continuously supervise anyone in a secure area who is not on the list of authorized park staff.
4. Granting of access to a secure area does not automatically include access to museum objects, archival materials, or museum records kept in those areas. Only persons with a legitimate need to use collection items will be granted access to them.
5. Anyone requesting access to secure areas or to museum collections must agree to comply with the provisions of the park's "Conditions for Access to Museum Collections."
6. These procedures will be reviewed every two years and revised as necessary.

Figure G.5. Sample Park Museum Collection Access Policy and Procedures

Eligibility for Access to Museum Collections:

Access to the collections should be granted by the Superintendent or designee to the following individuals:

1. **Individuals seeking to use collection for research or study.** An individual may request to conduct research on the collection by registering and making an appointment with the park museum staff.
2. **National Park Service staff from the Field Area Office, System Support Office, the Washington Office, centers, or other parks who are visiting the park on official business.** The nature of their work must require them to evaluate, inspect, or work with the collections or the rooms, cabinets, or cases housing the collections or with park records on the collections. Persons granted access under this category of eligibility do not necessarily have to be accompanied by park staff at all times; a decision in that respect will be based on their reasons for needing access and on other factors that the Superintendent may consider germane at the time.
3. **Representatives of Indian Tribes or Native Hawaiian organizations having official business with the park staff for examining archeological or ethnographic objects in the collections.** The Superintendent should ascertain if the individuals are official tribal representatives. Under this category, individuals will have access to collections associated with their own tribes.
4. **Non-museum park employees, including volunteers, who are being oriented to the park and their work or who require access to collections as part of their internal training.**
5. **Park maintenance and protection staff in the performance of their official duties.** Except in the most unusual circumstances, such personnel shall have access only to rooms in which collections are kept, not to storage cabinets or exhibit cases or to key boxes or other places where keys to cabinets and cases are secured. As provided below, other means shall be made available to these personnel for emergency access. Persons granted access under this item of eligibility do not necessarily have to be accompanied by curatorial staff, but should be whenever possible.
6. **Individuals or representatives of organizations, institutions, or corporations desiring to use objects or records in the collection for commercial or publicity purposes.** Such persons must satisfy the Superintendent that their purposes are legitimate and that the proposed uses are in keeping with park purposes and the NPS mission and will not reflect adversely on the park, the National Park Service, or a Native American tribe, if the request is for tribal materials. Access should not be granted solely on the grounds that access to the park's collection would be more economical or "easier" for them than access to another collection. When the park provides access, it is not authorizing publication, distribution, derivative works, exhibitions, reproductions, or other non-research activity.
7. **Employees of construction or service companies who require access to collection storage or exhibit areas in order to service or maintain the building or its utilities, including alarm systems.** Such persons will be allowed access only under the terms of a contract or purchase order issued by or for the park and only to those areas where they are supposed to work. Under no circumstances shall such persons be allowed unsupervised access to objects kept in storage

Figure G.5. Sample Park Museum Collection Access Policy and Procedures (continued)

cabinets and exhibit cases. Except as may be otherwise provided in the language of the contract or purchase order, all persons granted access under this item of eligibility must be accompanied at all times by authorized staff. The Superintendent or designee shall have the authority to restrict access otherwise granted by this paragraph, under such circumstances where it is deemed advisable.

8. **Other persons or groups of persons may be allowed limited access to the collections, on determination by the Superintendent or designee that such access will be to the mutual benefit of the persons or groups and the park.** Examples of circumstances to which this item of eligibility might apply include: tours for school classes, tours for members of museum organizations or historical societies, tours for families of park employees, orientation for local political/governmental officials, orientation for visiting Park Service employees not on official business, and tours for non-NPS museum personnel, teachers, and prospective researchers who are considering applying for permission to use or view the collection.

Figure G.5. Sample Park Museum Collection Access Policy and Procedures (continued)

VISITOR LOG

By signing this visitor log I acknowledge that I have read and agreed to conditions listed on the reverse of this log.

[illegible]

G:32

**U.S. Department of the Interior
National Park Service**

CONDITIONS FOR ACCESS TO MUSEUM COLLECTIONS

1. Access to collections and/or to a secure area by researchers is by appointment. Any limitations imposed on access due to collection conditions, staff availability, and security considerations must be imposed equally on all users, including park staff's personal research. Persons needing to have access are urged to make their requests known to the Superintendent or designee as far in advance as possible.
2. Prospective visitors should be aware that the park staff is extremely busy at certain times of the year and that authorized staff may not be available to assist them at those times. Accordingly, it is suggested that persons needing access make an appointment and be prepared to discuss alternative times with the staff when they submit their requests.
3. The park's decision to allow access may depend upon the condition of the materials, the availability of space for the requester to work, and appropriate supervisory staff. The park keeps space and staff available for visiting researchers.
4. The park requires registration of all researchers (including those inquiring through the mail, on the phone, or Internet). Registration information needs to include full name, address, telephone number(s), institutional affiliation, research topic and publication plans. This information must be updated yearly to remain valid. A valid picture identification card must be shown at the time of the visit. All materials requested by the user are recorded.
5. All non-staff visitors and all staff visitors who are not designated as authorized staff will be accompanied at all times by authorized staff when in museum collection storage areas, when working in open exhibits, or when working with original museum and archival materials.
6. All visitors must sign in and out of museum collection storage area(s) and reference/study rooms on the park's "Visitor Log."
7. Smoking, drinking, and eating are prohibited in collection storage and work spaces and reference/study rooms. Suitcases, briefcases, overcoats, plants, and animals, except guide dogs, are not allowed in collection storage and study areas. Researchers must use pencils/paper or portable computers for taking notes.
8. All guidelines for handling objects and archival and manuscript materials must be read and signed by all collection users, whether staff or non-staff. These guidelines are published separately and may be requested in advance of a visit. A copy of the guidelines also will be provided to each user at the time he/she arrives.
9. The park reserves the right to the following as a condition for granting access to the collections:
 - a. The researcher must agree to abide by any copyrights and state privacy and publicity legislation as well as duplication, publication, and citation policies.
 - b. The park, as a courtesy, requests two copies of completed research papers; publications; CD-ROMs; screen captures of World Wide Web work, derived from work on the collections, or which contain photographs of objects in the collections or copies of documents in the archival collections. Copies of formal reports and other published materials shall be provided at the researcher's expense. Copies of drawings, photographs, and other products of research shall be provided at the researcher's expense, except when doing so constitutes an economic burden, in which case the Superintendent can elect to defray those costs or waive the requirement for the researcher to provide the materials.

Figure G.7. Conditions for Access to Museum Collections

MEMORANDUM OF UNDERSTANDING

BETWEEN

[Name of Park]

and

[Name of Fire Company]

[City, State]

Article I

Background and Objectives

WHEREAS, [Name of Fire Company] hereinafter [Department/Company] and the National Park Service (hereinafter Service) and more particularly the [Name of Park], hereby enter into an Agreement to provide mutual aid and assistance for occurrences of structural fires, *[As applicable, insert language to identify other needs, such as wildfires, emergency medical services and hazardous materials spills for those occurrences]* on or within the boundary of said Park, a unit of the National Park System, United States Department of the Interior, that are within the response area of the [Name of Fire Company]; and

WHEREAS, pursuant to 16 U.S.C. 450bb, the Service administers the Park that was established as a unit of the National Park System, United States Department of the Interior; and

WHEREAS, pursuant to 16 U.S.C. 1b.(1), the Service may provide for the rendering of emergency rescue, fire fighting and cooperative assistance to nearby fire prevention agencies and for related purposes outside of the National Park System; and

WHEREAS, pursuant to 42 U.S.C. 1856a, the Service is authorized to enter into reciprocal agreements for mutual aid to furnish fire protection with any fire organization maintaining fire protection facilities in the vicinity of Service property and for other property for which said agency normally provides fire protection; and

WHEREAS, the Service and Company have determined that the Memorandum of Understanding herein described is compatible with the public interest.

NOW, THEREFORE, pursuant to 42 U.S.C. 1856a, both parties do mutually understand and agree as follows:

Figure G.8. Sample Memorandum of Understanding Between
a Park and a Fire Company

Article II Statements of Work

The Memorandum of Understanding (MOU) herein made is subject to the following terms and conditions:

General

(1) The purpose of this MOU is to provide mutual aid and assistance between [Name of Park] and the [Name of Fire Department/Company] of [Name of city or county and state], should emergency medical services be needed in structural fires *[as applicable, include wildfires or hazardous materials spills]* that occur on, or threaten or endanger property under the protection of either agency.

(2) The area of Park property covered by this MOU will be that area within the [Name of Fire Department/Company] response area of [Name of city or county and state].

(3) In the execution of this MOU, employees or agents of the company are not considered employees of the park or NPS.

(4) The Service, Park and the [Department/Company] waive all claims against each other for compensation for any loss, damage, personal injury, or death occurring in consequence of activities pursuant to this MOU.

(5) All structural fire suppression personnel will meet, as a minimum, the requirements found in NPS-58, Structural Fire Guidelines.

(6) The Park and [Department/Company] agree to notify the other of available training the areas identified in No. (8) below and participate in joint training exercises when possible.

(7) Park and Company representatives will meet Quarterly (January, April, July, October) to discuss mutual aid operations and to evaluate the MOU for revisions and renewal. Any revisions of this Agreement must be in writing, receive proper approval, and be signed by the parties hereto. Renewals will be subject to regulations existing at the time of renewal and such other terms and conditions deemed necessary to protect the public interest.

(8) The provisions of this MOU are divided into the following sections: Structural Fire; *[as applicable, include other sections, such as Wildfire (Forest Fire); Emergency Medical Service/Search and Rescue; and Hazardous Materials.]*

Structural Fire

(1) As an aid to implementing this MOU, selected members of the [Department/Company] (including the Fire Chief and the Ambulance Chief) will, at least annually, visit the Park and, accompanied by the Park Superintendent or designated representative, survey park buildings for the purpose of developing a Building Pre-Plan. Special fire fighting procedures necessary to safeguard museum objects and archival and manuscript collections housed within the structure will be identified in the Building Pre-Plan. Current floor plans of Park buildings will be provided to the Company Fire Chief.

**Figure G.8. Sample Memorandum of Understanding Between
a Park and a Fire Company (continued)**

(2) The Company will respond to all reported structural fires in the Park (within the [Department's/Company's] response area) as promptly as possible and with due regard for the safety of all persons. Upon arrival at the scene of the reported structural fire:

(a) *Park Ranger not at the scene.* The Officer-in-Charge for the [Department/Company] will check the perimeter of the building for signs of fire. If sign of a fire is detected, he/she will assume direction of all fire fighting activities until relieved by a superior officer or until the fire is extinguished and declared out. If no sign of a fire is detected, he/she will wait for arrival of a Park Ranger.

(b) *Park Ranger at the scene.* If the ranger has already checked the structure for sign of fire and the alarm system, he/she will so advise the Officer-In-Charge of the [Department/Company]. If not, the ranger and the Officer-In-Charge will jointly check the structure for sign of fire. If sign of a fire is detected, the Officer-In-Charge for the Company will assume direction of all firefighting activities until relieved by a superior officer or until the fire is extinguished and declared out. If the structure has been identified in the Building pre-Plan as requiring special precautions necessary to safeguard museum objects and archival and manuscript collections within the structure, the ranger will so notify the Officer-In-Charge. The ranger will notify the officer-in-charge of any hazardous materials in the collection (such as cellulose nitrate film).

(3) Each party to this MOU will furnish such equipment and personnel to aid the other party with a structural fire as can be made without jeopardizing the fire protection of its own area of responsibility.

(4) All requests for Park Aid to assist with a structural fire must originate from the Company's senior fire official at the scene of the fire to the Park Superintendent or designated representative.

[As appropriate, include language on wildfire (forest fire), emergency medical service/search and rescue, and hazardous materials.]

Article III

Term of Memorandum of Understanding

The Memorandum of Understanding hereby made shall terminate one (1) year from the effective date hereof, at noon, [Name of State] time, unless prior thereto it is relinquished, abandoned, or otherwise terminated pursuant to the provisions of this MOU or of any applicable Federal law or regulation. In addition, the MOU will expire at the end of the specified term unless formally reaffirmed or rewritten if necessary. The effective date of this MOU shall be the date of its execution by the Superintendent, [Name of Park].

Unless relinquished, abandoned, or otherwise terminated pursuant to the provisions of the MOU or of any applicable Federal law or regulations, the MOU will be considered for renewal.

**Figure G.8. Sample Memorandum of Understanding Between
a Park and a Fire Company (continued)**

Article IV Key Officials

This Memorandum of Understanding is subject to the conditions of the Superintendent or representative, and shall comply with the regulations of the Secretary of the Interior and other applicable conditions as outlined herein.

Superintendent
[Name of Park]
[Complete Address]

The President and Fire Chief of [Name of Fire Department/Company] will direct operations according to the conditions agreed to in this MOU.

[Name of President]
[Name of Department/Company]
[Complete Address]

[Name of Fire Chief]
[Name of Department/Company]
[Complete Address]

Article V Reports

Each party is responsible for its respective timekeeping and other required records and reports.

Article VI Termination

This Memorandum of Understanding may be terminated upon breach of any of the conditions herein or at the discretion of either party. Termination shall be done by providing ninety (90) days written notice to the other.

Article VII Required Compliance

All activities pursuant to this Memorandum of Understanding shall be in compliance with the requirement of Executive Order 11246, as amended; Title VI of the Civil Rights act of 1964 (78 Stat. 252: 42 U.S.C. 2000d et seq.); and with all other federal laws and regulations prohibiting discrimination on grounds of race, color, national origin, handicap, religion, or sex in employment and in providing facilities and services to the public.

No member or delegate to Congress, or resident Commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

**Figure G.8. Sample Memorandum of Understanding Between
a Park and a Fire Company (continued)**

This Memorandum of Understanding is subject to the provisions of 18 U.S.C. 1913, which provide:

No part of the money appropriated by any enactment of Congress shall, in the absence of express authorization by Congress, be used directly or indirectly to pay for any personal service, advertisement, telegram, telephone, letter, printed or written matter, or other device, intended or designed to influence in any manner a Member of Congress, to favor or oppose, by vote or otherwise, any legislation or appropriation by Congress, whether before or after the introduction of any bill or resolution proposing such legislation or appropriation; but this shall not prevent officers or employees of the United States or of its departments or agencies from communicating to Members of Congress on the requests for legislation or appropriations which they deem necessary for the efficient conduct of the public business.

Whoever, being an officer or employee of the United States or of any department or agency thereof, violates or attempts to violate this section, shall be fined not more than \$500 or imprisoned not more than one year, or both; and after notice and hearing by the superior officer vested with the power of removing him, shall be removed from office or employment.

Nothing contained in this Memorandum of Understanding shall be construed as binding the Service to expend in any one fiscal year any sum in excess of appropriations made by Congress for the purposes of this Memorandum of Understanding for that fiscal year, or as involving the Service in any contract or other appropriation for the further expenditure of money in excess of such appropriations.

IN WITNESS WHEREOF, the Superintendent of *[Name of Park]*, acting on behalf of the National Park Service, in the exercise of the delegated authority from the Secretary of the Department of the Interior, has caused this Memorandum of Understanding to be executed this *[Date]* day of *[month]*, *[year]*.

[Name of Superintendent or Manager]
[Name of Park or Center]

ACCEPTED THIS *[Date]* DAY OF *[Month]*, *[Year]*.

[Name of Fire Department/Company]

[Name of Fire Chief]
[Name of Fire Department/Company]

**Figure G.8. Sample Memorandum of Understanding Between
a Park and a Fire Company (continued)**

FULL SIZE VISITOR LOG

- **This full size visitor log and conditions for access to museum collections are your use.**
- **Save as a master set.**
- **Copy onto acid-free paper as needed.**

U.S. Department of the Interior

VISITOR LOG

By signing this visitor log I acknowledge that I have read and agreed to conditions listed on the reverse of this log.

[illegible]

U.S. Department of the Interior
National Park Service

CONDITIONS FOR ACCESS TO MUSEUM COLLECTIONS

1. Access to collections and/or to a secure area by researchers is by appointment. Any limitations imposed on access due to collection conditions, staff availability, and security considerations must be imposed equally on all users, including park staff's personal research. Persons needing to have access are urged to make their requests known to the Superintendent or designee as far in advance as possible.
2. Prospective visitors should be aware that the park staff is extremely busy at certain times of the year and that authorized staff may not be available to assist them at those times. Accordingly, it is suggested that persons needing access make an appointment and be prepared to discuss alternative times with the staff when they submit their requests.
3. The park's decision to allow access may depend upon the condition of the materials, the availability of space for the requester to work, and appropriate supervisory staff. The park keeps space and staff available for visiting researchers.
4. The park requires registration of all researchers (including those inquiring through the mail, on the phone, or Internet). Registration information needs to include full name, address, telephone number(s), institutional affiliation, research topic and publication plans. This information must be updated yearly to remain valid. A valid picture identification card must be shown at the time of the visit. All materials requested by the user are recorded.
5. All non-staff visitors and all staff visitors who are not designated as authorized staff will be accompanied at all times by authorized staff when in museum collection storage areas, when working in open exhibits, or when working with original museum and archival materials.
6. All visitors must sign in and out of museum collection storage area(s) and reference/study rooms on the park's "Visitor Log."
7. Smoking, drinking, and eating are prohibited in collection storage and work spaces and reference/study rooms. Suitcases, briefcases, overcoats, plants, and animals, except guide dogs, are not allowed in collection storage and study areas. Researchers must use pencils/paper or portable computers for taking notes.
8. All guidelines for handling objects and archival and manuscript materials must be read and signed by all collection users, whether staff or non-staff. These guidelines are published separately and may be requested in advance of a visit. A copy of the guidelines also will be provided to each user at the time he/she arrives.
9. The park reserves the right to the following as a condition for granting access to the collections:
 - a. The researcher must agree to abide by any copyrights and state privacy and publicity legislation as well as duplication, publication, and citation policies.
 - b. The park, as a courtesy, requests two copies of completed research papers; publications; CD-ROMs; screen captures of World Wide Web work, derived from work on the collections, or which contain photographs of objects in the collections or copies of documents in the archival collections. Copies of formal reports and other published materials shall be provided at the researcher's expense. Copies of drawings, photographs, and other products of research shall be provided at the researcher's expense, except when doing so constitutes an economic burden, in which case the Superintendent can elect to defray those costs or waive the requirement for the researcher to provide the materials.

Appendix R: Curatorial Care of Photographic Collections

Page

A. Overview	R:1
What information will I find in this appendix?	R:1
Why is preventive conservation important for these materials?	R:1
How can I find the latest information on care of these types of materials?	R:1
B. The Nature of Photographic Materials	R:1
What is the component structure of photographic materials?	R:1
Why should I identify photographic processes?	R:2
What are the basic types of final image materials and how do they deteriorate?	R:2
What are the various types of binder layers?	R:3
What are examples of primary supports?	R:4
Are there other structural concerns?	R:5
C. Preparing a Preservation Strategy	R:5
Why do I need a preservation strategy?	R:6
What are the basic elements of a preservation strategy?	R:6
How should I assess and control the environment?	R:6
Should I establish handling procedures and a disaster plan?	R:7
Should I rehouse photographic prints and negatives?	R:7
How do I rehouse photographic prints and film negatives?	R:7
How should I preserve color materials?	R:8
How do I evaluate photographic materials for conservation and further preservation?	R:8
Who should inspect film-base negatives?	R:9
What about reformatting and duplicating deteriorating materials?	R:9
Who should inspect copy images?	R:11
D. Preventive Conservation: Handling Photographic Collections	R:11
How do I handle photographic prints?	R:12
How do I handle daguerreotypes, ambrotypes, and tintypes: cased and uncased formats?	R:13
How do I handle glass plate negatives and transparencies?	R:13
How do I handle film-base black-and-white negatives and transparencies?	R:14
How do I handle slide collections?	R:15
E. Preventive Conservation: Storing Photographic Collections in the Proper Environment	R:15
How do I store photographic prints?	R:15
How do I store daguerreotypes, ambrotypes, and tintypes: cased and uncased formats?	R:16
How do I store glass plate negatives?	R:16
How do I store film-base black-and-white negatives?	R:16
How do I store color photographic collections?	R:17
What characteristics do I need to know about color photographic collections?	R:18
F. Preventive Conservation: Housing Photographic Collections	R:19
How do I house photographic prints and negatives?	R:19
What about paper photographic storage enclosures?	R:19
What about plastic photographic enclosures?	R:21
How do I house panoramic (oversized) prints?	R:22
How do I containerize sleeved prints?	R:23

What storage techniques do I use to rehouse photographic materials?	R:23
How do I house daguerreotypes, ambrotypes, and tintypes: cased and uncased formats?	R:24
How do I house glass plate negatives and positives (lantern slides)?	R:25
How do I house black-and-white negatives?	R:26
Why do I place color photographic collections in cold storage?	R:27
How do I determine what is appropriate cold storage?	R:27
What do I need to know about storage in a frost-free refrigerator?	R:27
What do I need to know about storage in a cold storage vault?	R:29
When can I remove original photographic materials from cold storage?	R:30
How do I house color slide collections?	R:30
G. Preventive Conservation: Exhibiting Photographic Collections	R:30
How do I exhibit photographic prints?	R:30
How do I exhibit daguerreotypes, ambrotypes, and tintypes: cased and uncased formats?	R:31
How do I exhibit color photographic collections?	R:31
H. Preventive Conservation: Inspecting Photographic Collections	R:32
What is the Condition Checklist for Visual Images?	R:32
How do I use this checklist?	R:33
Where do I find the checklist?	R:33
I. Conservation Treatment Issues for Deteriorated Photographic Materials	R:33
What does this section cover?	R:33
Why use a conservator?	R:33
What are the ethical considerations?	R:36
What treatments will the conservator use?	R:36
J. The Recovery of Water-Damaged Photographic Materials	R:40
How should I recover water-damaged materials?	R:40
What should I salvage first?	R:40
K. Selected Bibliography	R:41
List of Figures	
Figure R.1. Appropriate Light Levels for Photographic Media	R:7
Figure R.2. Relative Humidity and Temperature Requirements for Photographic Media	R:16
Figure R.3a-b. Condition Checklist for Visual Images (Sample)	R:34

APPENDIX R: CURATORIAL CARE OF PHOTOGRAPHIC COLLECTIONS

A. Overview

1. *What information will I find in this appendix?*

This appendix discusses the composition and physical structure of photographic materials and outlines their long-term care and preservation.

2. *Why is preventive conservation important for these materials?*

All photographic materials are especially vulnerable to deterioration when exposed to:

- inadequate environmental conditions
- improper storage enclosures
- careless handling practices
- damaging exhibition procedures

For this reason, preventive care is absolutely critical to the long-term preservation of these irreplaceable images.

3. *How can I find the latest information on care of these types of materials?*

Watch the following sources for new information and techniques:

- NPS *Conserve O Gram* (COG) series
- e-mail NPS *Museum Management Newsletter*

See the NPS Museum Handbook, Part I (MH-I), Chapter 3, Museum Objects Preservation: Getting Started, for a discussion of preventive conservation and conservation treatment.

B. The Nature of Photographic Materials

Photographs are images formed by the action of radiation, usually light, upon a sensitized surface. While often thought of as a single technique, photography is many hundreds of related chemical processes known by a wide variety of process and tradenames. Sources of assistance for descriptions of the various photographic processes are included in Section K.

1. *What is the component structure of photographic materials?*

The component structure of photographic materials includes a variety of:

- *final image materials*, such as silver
- *binders*, such as albumen, collodion, and gelatin
- *supports*, such as paper, plastic film, metal, or glass (also called the *base*)

Negatives, prints, transparencies, and slides are all photographs.

The laminate structure of prints is often further complicated by the presence of:

- secondary supports
- additional colorants
- coatings
- adhesive layers

2. *Why should I identify photographic processes?*

Identifying the photographic process (final image material, binder, and base) will allow you to accurately assess the relative short- and long-term stability of a specific photographic object.

3. *What are the basic types of final image materials and how do they deteriorate?*

The image in every photograph is created by materials that absorb and scatter light. Final image materials may include:

- photolytic or filamentary silver
- metallic platinum
- pigments
- organic dyes

The final image material in most nineteenth-century photographic prints is a finely divided *metallic silver*, identified as "printed-out" or "photolytic" silver. Photolytic, or metallic, silver particles are rounded in shape and scatter light, and, as a result, produce the red or brown image tones associated with nineteenth-century print materials in good condition. Photolytic silver particles are quite small and are extremely susceptible to image deterioration and rapid loss of highlight detail.

The final image material in most twentieth-century photographic prints is *filamentary silver*, which consists of bundles of intertwined filaments, resembling steel wool, that are huge in comparison to photolytic silver particles. These larger particles are significantly less vulnerable to image deterioration. Their irregular structure absorbs light rather than scatters it. Therefore, filamentary silver images are characterized by a neutral black image color, unless toned with gold, sepia, selenium, or hand-colorant.

All silver images are prone to severe oxidation and, as a result, undergo characteristic changes. Photolytic silver images exhibit general fading throughout, a loss of highlight detail, and a shift in image color toward warmer (more red or yellow) tones. Filamentary silver images, on the other hand, exhibit a significant shift in color from neutral black to yellow brown as they deteriorate.

Mirroring, a dark, mirror-like, reflective tarnish stain caused by oxidation, is a common symptom of deterioration in silver images. It often appears as a bluish, metallic sheen visible in a photograph's dense image areas when examined in reflected or raking light. Silver images also can be adversely affected by improper processing during

manufacture, resulting in a severely yellowed and faded final image material.

In platinum prints, the final image material is *metallic platinum*. Since platinum is a noble metal, it's not susceptible to oxidation. Therefore, platinum images don't tarnish or fade. Platinum is, however, a catalyst for cellulose deterioration. Platinum prints may exhibit an embrittled and discolored primary paper support.

Pigments, such as lamp black, burnt and raw umber, burnt sienna, and prussian blue, often have been used as final image materials for such printing processes as carbon, gum bichromate, and cyanotype. These pigments usually are dispersed in a binder, such as gelatin, gum arabic, or linseed oil, and tend to have good to excellent overall stability.

Finally, *organic (synthetic) dyes*, as used in most contemporary negative and positive color processes, are considerably less stable, and will fade both in the dark and upon exposure to light. The destruction or decolorization of organic dyestuffs in color photographs is due to irreversible changes in their chemical structure. Upon exposure to light, high humidity, or high temperature conditions, organic dyes are readily converted to oxidized and often colorless dye fragments.

4. *What are the various types of binder layers?*

The binder in photographic material is the transparent layer in which the final image material is suspended and protected. Binders are important in determining optical properties, such as surface smoothness, gloss, density, and color, as well as the overall stability of specific print materials. The binders most commonly used throughout the history of photography include:

- *albumen*, a globular protein from the white of hens' eggs
- *collodion*, a form of cellulose nitrate
- *gelatin*, a highly purified protein commercially produced primarily from animal hides and bones

Albumen (ca 1850-1900) actively deteriorates and yellows due to the inherent characteristics of the egg white protein and its chemistry. Albumen has a strong affinity for silver ions, and as a result, in processing these materials, colorless silver-albuminate complexes may be formed. Upon exposure to reactive sulfiding compounds, these colorless complexes may be converted to a yellow silver sulfide with a resulting increase in overall discoloration or staining leading to yellowing and loss of detail in non-image (highlight) areas. Albumen yellowing also occurs from prolonged exposure to light and high relative humidity conditions.

The albumen binder will expand and contract when exposed to fluctuating environmental conditions. Albumen prints, therefore, characteristically exhibit severely cracked and crazed binder layers. Albumen images almost always are mounted on a secondary support, since unsupported images will curl into tight rolls.

Collodion (ca 1851-1920) was used as a transparent binder in both glossy- and matte-surfaced photographic printing papers manufactured at the turn of the century as well as for ambrotypes, tintypes and the wet plate negative process that was introduced in 1851. Collodion is brittle, and is easily abraded and mechanically damaged when handled improperly.

Photographic *gelatin* (ca 1870-present) is a highly purified, homogeneous protein. While it is relatively stable and doesn't yellow severely like albumen, it is very reactive to changes in temperature and relative humidity conditions. When exposed to moisture, gelatin swells up to twenty times its volume, becoming soft and tacky. Finally, gelatin can serve as a nutrient for microbiological or fungal activity in conditions of high relative humidity and also is attractive to insects and vermin as a food source.

5. *What are examples of primary supports?*

The most common primary supports used throughout the history of photography include:

- paper
- glass
- flexible film
- sheet metal

In both historic and contemporary photographic print materials, the image-bearing layer usually consists of a coating on a *paper-based* support. When handled improperly, paper supports are susceptible to irreversible mechanical damage in the form of tears, creases, and losses.

In the early days of photography, these paper supports were manufactured from the highest quality rag fiber or chemically purified wood pulp. After 1881, machine-manufactured photographic papers were coated in the factory with a baryta layer, which consisted of the white pigment barium sulfate and gelatin. The baryta layer produced a highly reflective surface, allowing for greater contrast and brilliance in the final print. It also acted as a protective barrier between trace impurities in the primary support and the light-sensitive materials.

Plastic-coated, or resin-coated, photographic papers were introduced in the late 1960s. They were often subject to embrittlement, cracking, and/or localized fading of the photograph's silver image. Within recent years stabilizers have been introduced into these papers. As a result, current plastic-coated papers, when processed correctly, are considered to be as stable as fiber-based supports.

While *glass* was the favored image support material in the nineteenth century, these supports may deteriorate under unfavorable environmental conditions. The chemical composition of support glass is the single most important factor pertaining to the long-term preservation of collodion plates. Deterioration of the glass support can result in softening and

flaking of the collodion binder and varnish layers as well as discoloration and fading of the silver image.

Nearly all existing still and motion picture *films*, prior to the introduction of polyester film in 1955, were produced on a cellulose plastic support. Earlier films were made from cellulose nitrate, first marketed in 1889 and manufactured until 1951. See NPS *MH-I*, Appendix M, Care of Cellulose Nitrate Negatives. Later films were composed of a variety of cellulose acetate supports. All cellulose plastic bases are subject to hydrolysis upon exposure to adverse environmental conditions, particularly high relative humidity. The hydrolysis of cellulose nitrate film, for example, releases nitrous oxide, a strong oxidizing agent that aggressively attacks image silver and severely embrittles the plastic film base as well as all nearby materials. Cellulose nitrate film base also is highly flammable and will burn underwater, as it produces its own oxygen during combustion. Valuable cellulose nitrate negatives must be reformatted and placed in cold storage.

In acetate films, acid hydrolysis won't accelerate silver image deterioration. However, the indirect consequences of hydrolysis may result in massive shrinkage and physical deformation, such as cockling, buckling, and channeling of the film base. Furthermore, acid-catalyzed hydrolysis will cause fire-retardant additives, historically incorporated into the film base during manufacture, to be released and deposited as liquid-filled bubbles in the gelatin binder.

Some of the earliest photographic processes used *metal* as the image's primary support. A daguerreotype photograph, for example, is a silver-plated sheet of copper with the whites or highlights of the image being a silver-mercury-gold amalgam and the darks pure silver metal. The daguerreotype plate is susceptible to deterioration resulting in the formation of corrosion films, primarily silver sulfide, on the support's surface. Tintypes were manufactured on japanned iron plates. The japanned surface was usually composed of a mixture of raw linseed oil, asphaltum, and lamp black pigment. A tintype's iron support may corrode or rust at the plate's unvarnished edges or anywhere the protective japanned surface has been scratched or otherwise damaged. Corrosion of the iron support may result in irreversible flaking and/or loss of a tintype's image-bearing (collodion) layer.

6. *Are there other structural concerns?*

Yes. When you analyze the component structure of photographic materials, you will also need to evaluate the presence or absence of a secondary support, hand colorants, final coatings (waxes, gelatin, and spirit varnishes such as shellac) and adhesive layers. Photographic prints often have been hand-colored with a variety of media, sometimes fugitive, including watercolors, pastels, and aniline dyes. These additional components can strongly influence the final appearance and stability of all photographic materials. Rubber cement adhesives, for example, can irreversibly stain and yellow binder layers.

C. Preparing a Preservation Strategy

A general understanding of the nature of photographic materials provides a basis for developing a preservation strategy for the collection.

1. *Why do I need a preservation strategy?*

A preservation strategy will help you care for and protect these diversified collections. In establishing a preservation plan, you need to understand and consider many issues pertaining to format and type, condition, housing, value, access, and use. In determining value, for example, you need to ensure that the collection materials support the park's approved Scope of Collection Statement and that these photographs are important for their artifactual, evidential, associational, administrative, or informational value. For example, heavily-used collections of lower value may be granted higher preservation priority when compared with little-used materials of higher value. See *COG* 19/10, *Reformatting for Preservation and Access: Prioritizing Materials for Duplication*.

Photographic collections should be assessed by a conservator for condition, processes, and format. The conservator should carefully examine all types of items in the collections, including albums, scrapbooks, and newer items such as microforms. Owing to quantity, it is often difficult, if not impossible, to examine all photographic objects in a collection; however, boxes and groups of items can be randomly sampled and assessed for storage, treatment, handling, and exhibition needs. In doing so, the conservator may make a checklist for tracking and quantifying general condition and deterioration problems associated with various photographic items. See Section H for a condition checklist.

2. *What are the basic elements of a preservation strategy?*

A preservation strategy tells you how to do the following:

- monitor, assess and control the environment
- establish handling procedures and a disaster plan
- rehouse photographic images
- reformat color materials and preserve originals in cold storage, where appropriate
- evaluate photographic materials for conservation treatment
- inspect negatives
- duplicate deteriorating materials
- inspect copy images

3. *How should I assess and control the environment?*

Survey storage facilities and exhibition spaces for evidence of the potentially damaging environmental conditions of relative humidity, temperature, light, and pests.

- Maintain the relative humidity (RH) levels for most photographic materials at 20% to 40%. You should strive for this range when storing all types of photos in one area. However, if you are storing only film-base materials, the preferred range is at 20% to 30% RH.
- Store most color and film-base collections at 4.4°C (40°F) or below. When you place collections in cold storage, they should remain in cold

storage as much as possible. Therefore, make copy negatives and prints available for duplication and research use.

- Monitor and control the environmental conditions, especially relative humidity, in collections storage and exhibits to reduce the potential for microorganism growth. When RH reaches 65% and temperature rises above 75°F, the potential for microorganism growth increases.
- Use the photographs at the appropriate light levels. See Figure R.1.

Century	Type of Photograph	Appropriate Light Levels
19th	Most 19th century processes	< 50 Lux or 5 footcandles
Late 19th (1880s)-20th	Photographs with Baryta Layers, such as Gelatin Printing-Out Paper, Collodion Printing-Out Paper, and Gelatin Developing-Out Paper	< 100 Lux or 10 footcandles
20th	Modern color photographs	< 50-100 Lux or 5-10 footcandles

Figure R.1. Appropriate Light Levels for Photographic Media

4. *Should I establish handling procedures and a disaster plan?*

Yes! First, establish handling and preservation procedures that are oriented toward stabilizing the condition of the entire collection.

Then, ensure that these procedures are followed so that the level of preservation is consistent throughout the collection.

Finally, establish a disaster plan to protect the museum collections in an emergency.

5. *Should I rehouse photographic prints and negatives?*

If the photographic prints are in acid-free or acid-neutral housings, you don't need to rehouse them, unless the housing is damaged. In all other situations, you need to rehouse photographic materials in acid-free archival sleeves and folders.

6. *How do I rehouse photographic prints and film negatives?*

If you need to rehouse *photographic prints*:

- place each print in archival-quality plastic or paper enclosures to prevent damage from chemical deterioration and improper handling
- place the enclosure containing prints in a box or drawer
- place boxes or drawers on shelves or in cabinets

If you need to rehouse *glass plate negatives* and stabilize them:

- place negatives in four-fold archival paper enclosures
- place negatives upright on their long edge in padded boxes
- place boxes on shelves

- label boxes "Fragile Glass"

If you need to rehouse *photographic albums and scrapbooks*:

- box them to protect them from dirt, dust, and gaseous pollutants
- interleave photograph albums with neutral pH tissue

Don't use buffered tissue or acid-free paper.

- don't use interleaving materials if they will cause stress on album bindings (such as significantly swelling a volume's width)

If you need to rehouse *daguerreotypes, ambrotypes, and tintypes*:

- house them in acid-free folding boxes
- identify actively deteriorating cover glasses and replace them with contemporary high-grade alumina silicate glass
- have a trained conservator supervise the uncasing and resealing operations

If you need to rehouse *film-based negatives*:

- place each negative in a sleeve
- place each sleeved negative in a box or drawer
- place each box or drawer on a shelf or in cabinet

7. *How should I preserve color materials?*

After housing, place color photographic materials in refrigeration or cold storage to slow irreversible deterioration. Cold storage promotes a longer life for the photographs being preserved. Even 20°F below room temperature provides many decades of additional life for photographic materials. Store collections of color negatives, transparencies, and prints, in archival housing within Ziplock bags in boxes, in a frost-free refrigerator with low-humidity refrigeration. You may place humidity indicator strips within the bag to help monitor environmental conditions.

If you must remove materials from the cold storage vault, for example if the power has been out for longer than 48 hours, allow the materials to acclimatize at room temperature for several hours before handling them.

Don't forget to monitor the frost-free refrigerator for temperature and humidity levels and to establish retrieval and access guidelines to severely limit the removal of materials.

8. *How do I evaluate photographic materials for conservation and further preservation?*

You should work with a conservator to learn how to identify photographic processes and formats and deterioration characteristics. Check photographic materials for:

- active flaking or powdering
- mold growth

- tape or adhesives present
- severely deteriorated supports

Ensure that photographic materials with these conditions receive conservation treatment.

9. *Who should inspect film-base negatives?*

You should work with a conservator to:

- inspect film-base negative collections and evaluate them for deterioration
- establish duplication programs
- develop handling guidelines
- establish archival storage procedures

10. *What about reformatting and duplicating deteriorating materials?*

You won't always be able to preserve all photographs in pristine condition. When faced with massive deteriorating photographic holdings, you will need to strike a balance between stabilization, treatment, and duplication.

Some processes, such as cellulose acetate and cellulose nitrate negatives may totally self-destruct over time in a normal storage environment. The self-destructive images are said to have inherent fault or inherent vice. The only way to preserve cellulose nitrate and cellulose acetate negatives may be permanent cold storage. In order to save the informational content of these negatives, it is necessary to duplicate these images using more stable materials. See *MH-I*, Appendix M, Care of Cellulose Nitrate Film, and *COGs* 19/10 through 19/13 on preservation reformatting.

Other photographic materials, while not as prone to self-destruction as cellulose acetate or cellulose nitrate, will deteriorate as a result of use, such as exhibition, regular handling, or frequent duplication. These heavily used materials will also benefit from duplication, as the duplicates may become the copies for use while the originals are preserved in cold storage.

Some scholarly researchers may still need to view the originals in order to study the image's process, format, or technique. In most cases, researchers are interested in the informational value of an image. Informational values may be captured in high-quality photographic copies.

If you need to rehouse and/or duplicate film-base collections, carefully consider the following options:

- ***Interpositives.*** For maximum quality control during duplication, you should produce an interpositive (intermediate positive image on clear film). Make this interpositive from the original negative by contact printing the image onto a sheet of clear film, producing a positive transparency. Then, make a laterally correct (not reversed) copy negative from the interpositive. Retain the interpositive to serve as an

archival master used for the creation of additional copy negatives. Use the copy negative as the duplication master to produce copy prints for staff and researchers. Keep the original negative in cold storage.

- ***Direct Reversal Film.*** Another procedure requires the use of direct reversal film, to produce a direct but laterally reversed duplicate negative. The resolution of direct-duplicating film is good, although tone reproduction can be poor. Because of their fine-grained structure these films are prone to oxidation leading to silvering out and mirroring, hence image detail loss. These images must be accurately processed and toned during use and carefully inspected and tested after creation. Such requirements make the actual cost of direct duplicates equivalent to interpositive processes without providing the same quality of images. Request either polysulfide toning or gold toning which will extend the life of the negative. Be aware that gold toning can add 20-50% to the cost. In many cases, direct reversal or direct duplicate images, also known as direct positive images, don't produce publication quality negatives.

Selenium toner was frequently recommended for use with all copy negatives, particularly direct duplicate negatives. However, the Image Permanence Institute (IPI) in Rochester, New York has found that selenium may not adequately protect a filamentary silver image in low density regions from oxidative attack. Don't request selenium toning of photographs. IPI is currently investigating the use of a polysulfide toner to which a small percentage of borax is added. For additional information, contact the Image Permanence Institute, Rochester Institute of Technology, 70 Lomb Memorial Drive, Rochester, NY 14623-5604, 716-475-5199.

- ***Copy prints and camera negatives or long-roll camera film.*** Other duplication options to consider include producing of copy prints and camera negatives from the original negative or using a long-roll camera film for efficient and cost-effective duplication of large collections. As with direct reversal film, these processes won't necessarily produce publication or exhibition quality copies and some of the images' informational value may be lost.

When you are faced with massive deteriorating film holdings, consult a conservator. See *COG 19/10, Reformatting for Preservation and Access: Prioritizing Materials for Duplication*. You should carefully evaluate the available duplication options discussed above and consider the following factors:

- collection's size
- informational value
- evidential value
- associational value
- administrative value
- artifactual value

- condition
- projected use
- funding and staffing resources available

Collection value, usage, and risk or stability probably should determine which items you duplicate first. Don't dispose of original negatives once duplicated unless they are in an advanced state of deterioration.

Finally, you should establish two regular inspection programs:

- One should evaluate the technical and archival quality of the duplicate negatives. Compare the duplicate's optical, tonal, and physical characteristics with the originals. See *COG 19/13, Preservation Reformatting: Inspection of Copy Photographs*.
- The other should be used for all deteriorated film holdings. Select envelopes from every drawer at random and examine them for signs of deterioration as mentioned above. Note incipient deterioration so that you can monitor specific materials during the following inspections. Inspect collections with unregulated climates and generally poor conditions as many as four times per year.

11. *Who should inspect copy images?*

You should have all interpositives, negatives, prints, and slides, whether produced internally or by an outside photographic studio, inspected upon return.

All photographic copy work done for preservation purposes should be done to American National Standards Institute (ANSI) standards. Cite these standards in all contracts with photographers. Don't pay for duplication until after the copies pass inspection. Inspect the copy versus the original for: resolution, tonal range, completeness of image, and residual levels of chemicals. Materials that don't pass inspection criteria should be reshot at the photographic laboratory's expense. See Section K for a list of the appropriate standards.

Have someone experienced in reading negatives and in darkroom work, such as a photographer (other than the photographer who did the copy work), inspect all images. Inspection requires experience and a trained eye. See *COG 19/13, Preservation Reformatting: Inspection of Copy Photographs*.

D. **Preventive Conservation: Handling Photographic Collections**

All photographic materials, color as well as black-and-white, may be irreversibly damaged by fingerprints, scratches, abrasions, and other forms of mechanical damage or mishandling. Here are some guidelines.

1. How do I handle photographic prints?

Historic photographic prints may be irreversibly damaged if handled carelessly. The surfaces of these prints are delicate and, therefore, easily scratched, abraded, creased, cracked, or torn.

General guidelines for ensuring object safety during any handling procedure are outlined in *MH-I*, Chapter 6, Handling, Packing, and Shipping Museum Objects. Some basic principles for the safe handling of historic and contemporary photographic print materials are listed below.

- Prepare a clean and uncluttered workspace for the safe handling of photographic collections. Instruct staff and researchers on the proper ways to handle photographs.
- Establish and enforce handling guidelines (for example, restricting food, drink, smoking, the use of pens) for all staff.
- Wear gloves when accessing collections that aren't protected by enclosures and when handling photographs that require temporary removal from paper or plastic sleeves. Research at the National Archives of Canada shows that immediate interactions will occur between salt in human perspiration and a photograph's final image material. These interactions result in irreversible oxidation of image silver to silver chloride followed by image staining or mirroring where the fingers touch the image. Staff and researchers who are required to wear cotton gloves will often approach a photographic collection with additional care and respect.
- Use temporary or permanent auxiliary supports (such as pH neutral board) during handling if necessary. In all instances, handle the auxiliary support and not the object itself.
- Exercise special caution when using plastic sleeves. Clear plastic sleeves are often too flexible to prevent structural damage. Slip a piece of archival bond (neutral pH) behind the image back before placing it in the sleeve. Transcribe any information from the back of the image in pencil to the back of the archival bond.

Removing unmounted photographic prints from their polyester sleeves may prove difficult because of the static charge of the polyester film. Slit the plastic sleeve at a sealed edge and gently separate the cover sheet from the photograph by rolling it away from the object's surface.

- Control access to all collections. Using copy prints and/or xerographic copies will greatly reduce handling and subsequent damage. Restrict the photocopying of all original materials. In doing so, maintain and use a "master" set of xerographic copies for all subsequent photocopying. See *COG* 19/4, Archives: Preservation Through Photocopying, and 19/7, Archives: Reference Photocopying. Any collection that is regularly reproduced should have an effective system for creating master negatives so that originals need not be constantly photographed.

- Establish current inventories, finding aids, and container (such as box or folder) lists for all photographic collections to further reduce unnecessary handling.

2. *How do I handle daguerreotypes, ambrotypes, and tintypes: cased and uncased formats?*

You should consider the daguerreotype, ambrotype or tintype and its original housing as a total artifact deserving protection as a whole. Don't disturb these housings unless absolutely necessary. If for any reason you remove an original housing, carefully label and retain them.

If you remove an original housing, use a small suction cup to carefully lift the "photographic package" out of the miniature case interior. This maintains proper configuration and orientation of the fabric liner that serves as a "compression seal" within the case and further protects the photographic image from oxidation. Don't use a suction cup if the brass mat and tape assembly are damaged or not present.

Do not disassemble the photographic package without the supervision of a trained conservator.

Restrict the handling of all original material to only those researchers who are working on images as evidence of connoisseurship issues or those who can't obtain sufficient information from the copy. All other researchers should use copy prints. Secure totally unprotected daguerreotypes and ambrotypes immediately. See Section G. Separate them from the collection to ensure protection against casual handling. Use a Form 10-645, Archives and Manuscript Collections, Separation Sheet to maintain the link between the object and its original location within the collection. See *NPS Museum Handbook*, Part II, Appendix D, Museum Archives and Manuscript Collections for guidance on this form. The surfaces of primary images may be damaged by careless handling because they are very fragile.

Caution both researchers and staff not to open a case completely (180 degrees) when viewing an image as this may cause severe stress on the hinge. Don't use the metallic clasps as they tend to abrade the surrounding leather or paper on the case. If the case is warped, locking the case may break the spine.

Remove loose surface dirt from the case's interior and exterior surfaces with a soft brush. Don't use other cleaning methods because the unprotected surfaces of both daguerreotypes and ambrotypes are extremely sensitive and must be handled with utmost care. Only a trained conservator should clean these materials following a careful assessment of need.

3. *How do I handle glass plate negatives and transparencies?*

Collodion and gelatin glass plate negatives and transparencies are very susceptible to damage. Their weight, bulk, and inherent fragility often pose the potential for serious handling problems. When handling glass plate collections, follow these guidelines carefully:

- Never underestimate the weight of glass. When working with these materials, be sure to have a firm grip on all enclosures in which glass plates are housed.

- Always handle glass on a padded and smooth work surface. You can construct this type of surface by padding a rigid piece of eight-ply board with successive layers of unbleached linen followed by sheets of lens tissues attached to the reverse of the work surface with pressure sensitive tape. As the surface becomes dirty, the sheets of lens tissue can be easily removed.
- Never handle the emulsion surface of a glass plate negative or transparency directly. Wear unpowdered latex gloves, since cotton gloves may be awkward and are inappropriate for the handling of glass artifacts.
- Before removing glass plate negatives or transparencies from their original (and often opaque) storage enclosures, always examine them carefully to determine the negatives' condition. In some cases, binder layers may be actively flaking and/or partially adhered to their enclosures. Glass supports may be broken or cracked. Safe removal may require that the original enclosures be slit at two edges with a microspatula and the plate carefully removed without scratching the glass or emulsion.
- Duplicate these fragile materials whenever possible. Use the copies for duplication services and reference purposes in order to avoid unnecessary handling of the original materials.

4. *How do I handle film-base black-and-white negatives and transparencies?*

Carefully restrict access to all film negative or transparency collections. The chemical by-products of deteriorating film could be dangerous to staff and visitors, resulting in skin and eye irritation, headache, nausea, and respiratory difficulty.

You can mitigate these effects by taking the following precautions:

- Improve room ventilation and air quality by changing the position of supply air registers and the overall level of air movement
- Use fans to maintain air movement while working with these collections
- Wear protective gloves at all times when handling film collection material
- Wear an appropriately rated respirator when handling large quantities of these materials. Respirators are not considered protective if facial hair interferes, because a proper fit cannot be assured. The respirators must be fitted to each employee. See NPS-50, *Guideline for Loss Control Management*, Release No. 2, Chapter 32, Respiratory Protection Program, for detailed guidance.
- Limit exposure time by staff and visitors

See *MH-I*, Chapter 11, Curatorial Health and Safety, for additional guidance.

5. *How do I handle slide collections?*

- Handle slide collections carefully to protect them from physical damage, fingerprints, and dirt.
- Don't leave slides in illuminated viewers or on light tables for longer than is absolutely necessary. (Kodachrome slides are particularly sensitive to light fading.) Also, don't leave slides uncovered on desks and table tops, as this exposure to ambient light may induce irregular fading and image deterioration.
- Keep the projection time for original slides to a minimum and use expendable duplicates whenever possible.
- Don't use high-intensity xenon arc projectors or other projectors that have been modified to increase their light intensity. It is usually light, and not heat, that causes fading when a slide is projected. (Some slides, however, may be more susceptible to heat-related damage, such as those with silver images including Polaroid Polachrome instant color slides and all types of black-and-white transparencies.)

E. **Preventive Conservation:
Storing Photographic
Collections in the Proper
Environment**

Environmental stability is essential to the longevity of all photographic collections. Where different types of photographic collections are stored in one space, you will need to set up many microenvironments in boxes or cabinets. Find the mean average humidity of what all materials in the room may need and use silica gel, humidifiers, or dehumidifiers as necessary to adjust the relative humidity. Specific materials need specific preventive conservation measures.

1. *How do I store photographic prints?*

Store photographic print materials at a **constant** relative humidity (RH) between 30% and 50%, in dark storage (boxed). Avoid RH fluctuations of more than 5%. Exposure to high relative humidity levels dramatically accelerates the rate of deterioration and can result in the oxidation of silver image materials, binder layer staining, mold, and even permanent changes in size and shape. Excessively dry conditions, on the other hand, may cause cracking, crazing and embrittlement.

Store most photographic prints at 20°C (68°F) or below. Store contemporary color print materials at 4.4°C (40°F) or below.

The fading of color images is primarily controlled by the storage temperature and to a lesser degree by relative humidity. In all cases, carefully monitor temperature and relative humidity levels as described in *MH-I*, Chapter 4, Museum Collections Environment. See Figure R.2 for relative humidity and temperature requirements for various media.

Also, you will need to monitor and control (through air filtration) the levels of particulates and gaseous pollutants such as nitrogen dioxide, sulfur dioxide, hydrogen sulfide, and ozone.

Type of Photograph	Storage Temperature	Storage RH (Relative Humidity)
Most photographic prints, black and white negatives, direct positives, and transparencies	<68°F (20°C)	30-50% RH
Ambrotypes, daguerreotypes, and tintypes (Cased and Uncased)	65-68°F (18-20°C) ±2°	40-50% RH
Glass plate negatives and positives	68°F (4.4°C) ±2°	35% RH ±3%
Black-and-white silver gelatin film based negatives cellulose nitrate and acetate	As low as possible	20-30% RH
Color photographic prints, negatives, slides, and positive transparencies	35-50°F (2-10°C)	20-30% RH

Figure R.2. Relative Humidity and Temperature Requirements for Photographic Media

2. *How do I store daguerreotypes, ambrotypes, and tintypes: cased and uncased formats?*

Daguerreotypes, ambrotypes, and tintypes are composed of a wide variety of materials. Store them at a RH of 40%-50% and temperature of 18°-20°C (65°-68°F).

Brass mats and preservers and iron supports of tintypes corrode at high relative humidity levels. Also, the glass used in glazing materials or actual supports for these photographic images is often chemically unstable. Don't store them in relative humidity conditions above 50% RH. On the other hand, leather, paper, and wood may become embrittled and cracked if stored in very dry conditions, contributing to structural deformations of the case. Maintain the relative humidity for these materials above 40%.

3. *How do I store glass plate negatives?*

Historic glass plate negatives are complex, laminate objects that require specific and controlled storage environments. The safe relative humidity range for the storage of glass plate negatives at room temperature conditions is 35% ± 3%. Avoid temperature and relative humidity fluctuations.

If the relative humidity is too low (below 30%), you may see severe flaking of the image-bearing layer from its glass support. If RH is too high (greater than 40%), you may see glass corrosion, silver image deterioration, microbiological attack, and even physical damage to the binder layer and varnish coatings.

4. *How do I store film-base black-and-white negatives?*

One of the most pressing problems facing large photographic holdings is the active and rapid deterioration of their film-base negative collections. Many unique images exist only as negatives. You will need to give the preservation of their informational content the highest priority.

Store these materials at 20%-30% RH and at temperatures as low as possible.

A very significant increase in film life is possible when storage humidity is lowered below 50%. Lowering the RH from 50% to 20%, for example, can improve expected film life four-fold.

Some other storage considerations for film-base negatives:

- Use a cold storage vault or commercially-available frost-free refrigerator or freezer to retard deterioration and prevent irreversible loss. Select these units carefully and monitor them routinely for temperature and relative humidity levels. See Section F.10.
- Restrict access to the materials housed within these units to staff who have been instructed in the procedures for collection retrieval of refrigerated or frozen items.
- Pack the negatives carefully in boxes. House negatives in Ziplock brand bags with humidity indicator strips.
- Use copies to access the original negatives in cold storage for copying or reference. If you must remove the originals for any reason (such as if you have a power outage of greater than 48 hours) allow them to acclimatize at room temperature for several hours before allowing access and use.
- Store deteriorated film-base collections in a well-ventilated location.
- Segregate nitrate films from other collections, preferably in their own freezer.

5. *How do I store color photographic collections?*

Color materials, including color negatives, slides, positive transparencies, and prints, are considerably more complex in construction than contemporary black-and-white materials. The storage environment is important.

Store these materials at 20-30% RH with a maximum temperature of 2°-10°C (35°-50°F). Store them for long-term at the lower rate, and be sure to avoid cycling. With color print, negative, transparency, and slide collections, *storage temperature is the most significant factor* in determining the rate of image fading and staining. Each -12°C (10°F) reduction in temperature will approximately double the life expectancy of color materials, as long as they aren't removed regularly from cold storage. High RH levels (greater than 65% RH) will promote the growth of fungus on emulsions, resulting in irreversible damage.

Color photographs are typically composed of at least three separate dye layers, consisting of cyan, magenta, and yellow organic dyes. The specific deterioration of these color photographic processes is often characterized by an overall loss of density; shifts in color balance caused by the unequal fading of the cyan, magenta, and yellow dyes; changes in contrast; loss of detail; and overall yellowish staining.

In addition, color photographic prints may crack and delaminate due to exposure to light or to widely fluctuating relative humidity.

6. What characteristics do I need to know about color photographic collections?

*Color image deterioration is the result of inherent instability of organic dyes. Consult Henry Wilhelm's and Carol Brower's book, **The Permanence and Care of Color Photographs: Traditional and Digital Color Prints, Color Negatives, Slides, and Motion Pictures** for more specific information on identifying and categorizing these unique deterioration characteristics.*

- **Dye fading that occurs in dark storage.** Like light fading, dark fading stability is also specific to the type of color film or print materials. The rate of dark fading is primarily a function of temperature and typically results in a final shift in color balance, as the cyan, magenta, and yellow dyes fade at differing rates.

Some color processes, such as Ilfochrome and Kodak Dye Transfer, are very stable in the dark. Kodachrome slide film is more stable in dark storage than Ektachrome slide film. Ektachrome, however, is more stable than Kodachrome if they are routinely projected.

- **Dark storage yellow stain formation.** This type of deterioration typically occurs with some color (chromogenic processes, including Kodachrome and Ektachrome) materials and often is a more serious problem than dye fading. For example, many Kodacolor prints dating from 1942-1953 now exhibit severe yellow stain formation especially prominent in their margins. This discoloration is caused by the unstable magenta dye-forming color couplers that remained in these prints following processing.
- **Choice of processing method.** The method of processing (stabilized or water wash) will often directly influence final image stability and the rate of stain formation. The image stability of instant color photographic processes (a stabilized process), for example, is very poor. Objectionable levels of yellowish stain may be observed in these stabilized, non-water washed materials after only a few months of dark storage.
- **Processing shortcomings.** Decreased dye stability and/or increased stain levels may result if color materials are processed using improperly replenished or contaminated chemicals or if the photograph isn't washed adequately so that residual processing chemicals remain. See Section G for a list of ANSI standards.
- **Image fading, staining, or physical deterioration.** These factors may be worsened by post-processing treatments. The application of lacquers, retouching materials, and high-pressure mounting techniques may adversely affect a photograph's final image stability.

F. Preventive Conservation: Housing Photographic Collections

1. *How do I house photographic prints and negatives?*

Consider funding and staffing, environmental conditions, and the use of the collection when deciding which type and style of enclosure to use. Individually folder, sleeve, or interleave mounted and unmounted photographs within acid-free boxes or stainless steel file drawers. Suitable photographic enclosure materials may be composed of chemically stable plastic or unbuffered, neutral pH paper materials. See COG 14/2, Storage Enclosures for Photographic Prints and Negatives.

Use the following guideline when selecting and ordering supplies, and require that the vendor meet its specifications: ANSI Standard IT9.2 1991, *Photographic Processed Films, Plates and Papers - Filing Enclosures and Storage Containers* (see Section K).

See the NPS Tools of the Trade (TOT), A Listing of Materials and Equipment for Managing Museum Collections, for sources of housing materials as well as other curatorial supplies discussed in this appendix.

2. *What about paper photographic storage enclosures?*

Paper storage materials must have passed an accelerated aging test known as the Photographic Activity Test (PAT). (Check with the vendor.) The PAT determines whether there will be harmful chemical or physical interactions between a photograph and its paper enclosure over its storage lifetime. (The PAT is described completely in ANSI IT9.16-1993.)

Photographic storage enclosures made of paper should have a high alpha cellulose content, a non-degraded form of cellulose frequently found in high-rag-content paper most desirable for paper to be permanent. Paper enclosures should contain no lignin, ground wood, or alum-rosin sizing. Printing ink shouldn't bleed or transfer, nor affect the image of the photograph.

The enclosure materials should be pH neutral at 7-7.5, and the paper *must be unbuffered* (not have an alkaline reserve). Current research, however, indicates that using buffered enclosures to house salted paper, albumen, gelatin, platinum, and collodion processes isn't detrimental provided humidity levels are maintained. It isn't necessary therefore to replace present buffered enclosures with unbuffered materials; however, purchase unbuffered paper enclosures when choosing new supplies.

Contemporary color processes, most particularly dye transfer and cyanotypes, require the use of unbuffered papers and enclosures.

There are a number of advantages and disadvantages in using paper enclosures for photographic storage. They are easy to write on and are generally less expensive than plastic materials. They are opaque, thereby protecting photographs from light. Unfortunately, this requires the users to remove each photograph from its individual paper enclosure prior to examination, which increases the possibility of damage.

All enclosures should be standardized and made to fit easily in acid-free boxes. Identify the photographic image in pencil on the outside of each folder before inserting the print.

Paper enclosures are available in several forms including envelopes, seamless enclosures, and folders. Try to use the four-fold seamless storage enclosure; it has no adhesive seam to attract moisture and contribute to image deterioration. You can easily remove the image from the enclosure without danger of abrasion. You can, however, support fragile materials on two-ply ragboard (of neutral pH bond) by placing the ragboard behind the image within the envelope to provide better support.

You can also place prints in individual acid-free folders, even placing several photographs in one folder. In this situation, interleave each photograph with a neutral pH, unbuffered sheet of paper which has been cut to the size of the folder. Don't place more than 15 items in a single folder.

Various types of unbuffered paper envelopes are available from conservation supply companies. Use envelopes with a narrow side seam, sealed with a non-hygroscopic and non-reactive adhesive, rather than a thick central seam. During storage, be sure the emulsion or binder side of the photograph faces away from the seam. Use envelopes with a top flap, as the flap prevents dust from entering the envelope. Each envelope should only hold one photograph; when this isn't possible, interleave them.

Don't use glassine or kraft paper envelopes for photographic storage.

You can mat mounted and unmounted photographs with 100% acid-free neutral pH ragboard window and back mats. See COG 13/1, Window Mats for Paper Objects. Fragile, damaged or severely warped mounted photographs as well as all photographs exhibiting a flaking binder layer may require sink mat and mount housing for additional protection. A sink mat is a museum mat for paper objects that has a recessed section in the bottom sheet that protects the paper object from contact with the overmat or cover sheet. Use sink mats for photographs that have been hand-colored with friable media such as charcoal, pastel, conte crayon, and similar media that can easily be smeared, as well as for photographic prints that have damaged surfaces.

Never dry mount onto secondary supports or laminate previously unmounted photographic prints.

Matted photographs may be hinged into their back mats with long-fibered Japanese tissue hinges attached with wheat starch paste, or mounted with good quality paper photo corners. Don't use polyester photocorners, particularly on fragile images, because they can cause abrasion. Don't use hard plastic corners or flanges because they may not be chemically neutral and some have sharp edges that may scratch, abrade, or emboss a photograph.

Paper photo corners, which should be as large as possible, are the most convenient and safe means of attachment when used properly. You can

fabricate these in-house from acid-free dense paper or purchase them from a conservation supply company. See *COG 14/1*, Making Mounting Corners for Photographs and Paper Objects. Any photograph with edges covered by the window mat may be mounted this way if it is strong enough to withstand its own weight resting on its lower corners while on display. The corners should be loose around the outer edges, to allow the photograph to expand with changes in relative humidity.

Reinforce the corners with a strip of archival quality linen tape or with pressure-sensitive tape adhered to the back mount. (The recommended pressure-sensitive tape for archival purposes is 3M 415 double-sided, polyester transparent tape coated with an acrylic adhesive.)

For storage, insert a sheet of unbuffered, light-weight neutral pH paper or polyester film between the photograph and the window mat to guard against abrasion. Examine carefully previously matted materials to determine their construction and materials stability.

3. *What about plastic photographic enclosures?*

Use plastic enclosures because they have the advantage of allowing an image to be viewed without removing it from the enclosure. This technique *greatly* reduces the possibility of handling damage and is ideal for large, high-access collections that haven't been copied.

If you use plastic enclosures, give special concern to humidity control. Photographic emulsions may stick, or "ferrotype," to the slick surface of these materials.

Use plastic materials ONLY if you can maintain relative humidity below 70%.

Suitable plastic enclosure materials include uncoated polyester and polypropylene. Don't use the following materials for housing photographic prints, negatives, transparencies or slides: chlorinated plastic such as polyvinyl chloride (PVC) or polyethylene sheeting, highly plasticized sheeting or coatings, or cellulose triacetate film.

Because of the build-up of static electricity, don't use plastic materials, especially polyester film, for housing photographs that have a flaking or friable binder layer or applied color.

Don't use plastic housing materials for images on glass, either negative or positive, as they are very prone to image flaking.

Also, one side of some polyester film photographic storage sleeves are slightly matted to avoid ferrotyping. The matting is done with silica dioxide or through roughening of one surface. Don't use these "matted" or "frosted" films for photographic storage.

You can choose from a wide variety of plastic enclosure designs available from conservation supply companies. Here are a few examples:

- *Plastic sleeve.* The sleeve is a plastic enclosure that opens along two or three sides. One particular polyester sleeve design you may want to use opens along both long sides with a flap. The flap allows inserting and removing of the photographs without potentially

dangerous sliding. "L" sleeves, sealed along a long and short edge, also allow for easy and safe access to a photographic print.

You can cut neutral pH, unbuffered mat boards (.01"-.02" thickness) to standard sizes and then insert them into the plastic sleeve, behind the photograph. The clear plastic sleeve allows the photograph to be viewed without being removed, and therefore protects the photograph from scratches, dirt and fingerprints. The neutral pH, unbuffered board neutralizes acids, provides fragile photographs with additional support, and allows the print to be identified without labeling directly on the image.

Take care when handling sleeved photographs, since they may slip or fall out of the open sides of the enclosures.

- ***Polyester folder.*** This enclosure is made by welding two sheets of polyester film together along one edge. These folders are most successful when used inside neutral pH, unbuffered paper envelopes. The polyester folder protects the photograph from handling whenever you remove it from the envelope.
- ***Polyester sheet with multiple pockets.*** You can use this system for housing small mounted and unmounted photographic prints within a larger-sized standard folder. It consists of two polyester film sheets that have been welded together to form standard-sized clear polyester film pockets or pouches. To maintain the original order of a collection, all images should be of the same size if this system is being used. Therefore, it may not be practical for a varied size collection.
- ***Unbuffered acid-free folder with polyester film overlay.*** This paper folder has the addition of a sheet of clear polyester film attached to its inside, along the right margin. It can be made in-house or purchased from archival vendors. This storage enclosure is particularly effective for housing unmounted and fragile albumen photographs that often have a strong tendency to curl.
- ***Polyester/ragboard enclosure.*** These "handling folders" are available commercially in standard sizes. They consist of a sheet of polyester film adhered at two edges in an "L" shape, adhered to a fractionally larger sheet of four-ply buffered acid-free ragboard. The photographic print is slipped under the polyester sheet and housed flat. This enclosure provides unmounted and fragile photographic prints with additional protection. However, mounted photographs are more likely to slip and slide within it, so this design isn't appropriate for all photographic formats.

4. *How do I house panoramic (oversized) prints?*

Panoramic prints, usually longer than "normal" photographic prints, are often found in a tightly rolled and vulnerable configuration. While you can flatten a loosely rolled print by placing it between two pieces of clean, dry, blotting paper under weights, many tightly rolled prints will crack and tear irreversibly if forced open without the proper humidification and flattening procedures. Consult a trained photographic conservator if in doubt.

You can house flattened panoramic prints in polyester film sleeves with a fold-lock closure at the long edge. You can purchase pre-welded lengths of rolled polyester in a variety of widths that can be cut to size as required. You can also insert a four-ply ragboard support into the sleeve for increased protection. Be sure to transfer any identification information from the back of the print to the back of the board *before* housing the print in the sleeve.

You also may house panoramic prints flat in heavy-weight paper folders. In some instances, it may be necessary to house these large format materials rolled onto neutral pH unbuffered tubes. Take care that the diameter of the tube is sufficiently large (4" or greater) to ensure adequate protection of the photograph. Once rolled with the binder side inward, cover the tube with polyester film, attached with a velcro button closure.

5. *How do I containerize sleeved prints?*

Once they are housed in individual storage enclosures, you can place photographic prints in acid-free file folders and special acid-free storage boxes that are free of lignin, ground wood, and alum-rosin sizing. Paper and board stock used to construct these storage boxes may be buffered (have an alkaline reserve). Use flat storage, in shallow acid-free boxes or flat file drawers, for fragile photographs and those which are adhered to brittle mounts. Be sure that all folders or enclosures exactly fit the inner dimensions of the storage box, so that they will stack neatly and not shift dangerously.

If they are in generally good condition, you can store 10" x 12" or smaller photographs upright in boxes or acid-free hanging file folders. Boxes and file cabinets must not be overcrowded, but also must not be so loosely filled that all support is lost. Equip vertical file drawers with rigid support of metal or acid-free mat board every 6"-8".

Fire resistive (insulated) filing cabinets are not recommended because they don't use space efficiently. They also are bulky for storage areas, and very expensive. A better storage method is to house photographs upright in boxes on steel shelving units.

6. *What storage techniques do I use to rehouse photographic materials?*

No single storage system is ideal for all photographic materials. Base your storage decisions upon format, type, condition, use, and value of the photographs. Those materials that are most heavily used should probably be rehoused first, followed by original photographic prints of high value and/or in fragile condition. A strategy for setting priorities is described in *COG 19/10, Reformatting for Preservation and Access: Prioritizing Materials for Duplication*. In order to reduce damage caused by handling, house those photographs most often used and requested in plastic enclosures. In all cases, use standard-sized storage enclosures only.

Photographic objects are particularly susceptible to the potentially reactive and volatile by-products released by some of the materials used in the manufacture of storage cabinets. Use only galvanized or stainless steel cabinets or steel cabinets coated with a baked-on-enamel finish or non-reactive powder coatings. These powder coatings are made by electrostatically applying powdered epoxy resin that is fused to the

enamel finish with heat. No solvents or plasticizers are used in the process.

Remove paper clips and staples from all photographs before storing them. Rusty paper clips or staples or other metal attachments may permanently stain, fade, emboss, and/or tear photographic prints. See *COG 19/5, Removing Original Fasteners from Archival Documents*.

During rehousing, examine all photographic items to assess the need for further preservation treatment. Learn to identify those deterioration problems that require immediate conservation treatment, such as photographic materials exhibiting actively flaking binder layers, the presence of pressure-sensitive and rubber-cement adhesives, and severely deteriorated and embrittled primary and secondary supports.

The presence of active mold growth is another critical problem that you should address immediately. You can prevent continued bio-deterioration by removing spores via aspiration, and then controlling the environment stringently.

7. *How do I house daguerreotypes, ambrotypes, and tintypes: cased and uncased formats?*

These objects are frequently found housed in their original decorative folding cases that were often constructed of wood covered with embossed leather or paper. The photographic images are protected by a lacquered brass mat and a cover glass, usually bound together with paper tape and further covered with a decorative brass foil or preserver.

Each miniature cased object should have individual housing protection in the form of a wrapper or container that conforms to its three-dimensional format. You can house cased photographs in individual, custom made, four-flap boxes of heavy-weight acid-free folder stock. Boxes are also available from a variety of conservation suppliers in stock sizes.

Write the catalog number and other identifying information in pencil on the outside of the box. If possible, use acrylic adhesive on 3M mounting tape to adhere a 35mm contact print of the image to the outside of the storage box to help minimize handling of these fragile artifacts. Store the arranged cases flat, by size, in acid-free boxes or padded drawers. Vertical storage may be necessary for larger collections where space is a problem.

- ***Loose daguerreotype plates.*** These materials are extremely vulnerable, so give them the highest priority for protective housing. This may consist of a sink mat (see Section G), alumina silicate cover glass, and a pressure-sensitive tape seal. The sink mat may be fabricated from an acid-free unbuffered ragboard or die cut from 60 point polypropylene sheeting. To ensure adequate protection, use ragboard that has passed the PAT. When purchasing ragboard, check vendor's specifications. Filmoplast P-90 and Permacel J-Lar 4000 pressure-sensitive tapes have been successfully used for binding daguerreotypes. These chemically stable tapes are both manufactured using an acrylic adhesive. J-Lar provides a better barrier to moisture. The specific composition of these tapes may change in time. Therefore, rehoused daguerreotype plates must be carefully monitored to ensure that their deterioration isn't progressive.

Identify actively deteriorating cover glasses and replace them, as time permits, with contemporary glass. Ask a conservator to supervise all uncasing and resealing operations.

- ***Loose ambrotypes.*** House loose ambrotypes in four-flap neutral pH paper enclosures or envelopes. Protect the glass support from breakage by including a four-ply neutral pH ragboard sheet. House broken or cracked ambrotype supports in a sink mat, or sandwich them between two sheets of ragboard to await further treatment. Note that the ambrotype's surface is easily abraded and scratched, although the surface isn't as delicate as the daguerreotype's surface.
- ***Loose tintypes.*** House loose tintypes in good-quality paper or plastic, such as polyester and polypropylene film, enclosures. Four-ply ragboard inserted behind the tintype will provide its flexible support with additional protection. House sleeved tintypes vertically in acid-free boxes (never in plastic enclosures).

For tintypes that exhibit a flaking collodion binder layer, use four-flap paper enclosures only.

8. *How do I house glass plate negatives and positives (lantern slides)?*

Use a four-flap neutral pH paper enclosure for storing glass plate negatives and lantern slides in good condition. These enclosures should meet ANSI IT9.2 specifications (see Section K).

Storing each plate in its own enclosure prevents rubbing and abrasion on the plate. When using the four-flap enclosure, place the glass plate image in the center with each flap carefully folded over the emulsion side. This avoids the necessity of sliding the image in and out of the enclosure. Write any pertinent information in graphite on the outside of the seamless enclosure before the image is inserted. Some commercially-made paper sleeves aren't suitable for glass plate storage, as photographic emulsions can be irreversibly damaged through the action of sliding the plate in and out of an envelope.

Never use plastic sleeves, envelopes, or folders with glass plates. Don't place glass plates in cold storage.

Caution: Only excessively dirty materials and/or those designated for duplication require cleaning. You should only attempt this cleaning after determining the emulsion side of the glass plate, usually the less glossy side. (If a question remains, consult a conservator.) During rehousing, carefully clean the non-emulsion or base side of the glass plate with a soft brush followed by a cloth slightly dampened with distilled water. Don't allow moisture to come in contact with the emulsion side of the glass plate.

House all glass plates according to size after making careful notes on their original order. Store glass plate negatives and lantern slides that are in good condition and smaller than 10" x 16", vertically (upright) on their long edge within the sleeves. Store them in metal file drawers or in acid-free, flip-top, reinforced boxes that contain no lignin, ground wood, or alum rosin sizing.

In each case, cut pieces of four-ply neutral pH ragboard to the size of the enclosures and place them as rigid dividers between every five to ten individually enclosed plates. These dividers will help support the weight of the plates and will also ensure that these fragile glass plates remain in an upright position as the collection is accessed by staff. Insert additional dividers or wedges to fill up extra space in a box or drawer.

Don't use traditional wooden grooved boxes for glass plate storage.

Cracked or broken glass plates should be duplicated to eliminate the need for further handling. Support them on their emulsion side with a clean, clear single-weight piece of high alumina silicate glass or non-textured Plexiglas of the same dimension. Protect the supported plate on both sides with four-ply neutral pH ragboard also cut to the size of the damaged negative. Then seal the sandwich at all edges with Filmoplast P-90 pressure-sensitive tape, and note the subject matter and condition on the ragboard support.

House glass plate negatives that exhibit active flaking or deteriorated binder layers and/or broken glass supports in custom-made neutral pH sink mat housings. Build these mats out of acid-free, single-walled corrugated board, laminated together with 3M 415 double-sided pressure-sensitive tape. Use neutral pH ragboard shims, attached to the back mat with 3M 415 tape to separate glass fragments to prevent abrasion along broken interfaces. Construct each sink mat with a hinged lid and be sure its height is sufficient so that its lid doesn't come in contact with the negative's surface. Standardize the outer dimensions of all sink mats.

In most cases mending isn't required and protective housing as described above should be sufficient. If mending is deemed necessary, ask a conservator to do it.

Finally, mark all folders and boxes containing glass clearly with the word "GLASS." Don't house boxes of glass plate negatives on upper or bottom shelves where they may be difficult to reach or lift. Glass plate negatives are easily damaged by vibration. Avoid housing them on mobile shelving.

9. *How do I house black-and-white negatives?*

Use three layers of protection when storing black-and-white negatives:

- Place each negative in a sleeve
- Place each sleeve in a box or drawer
- Place each box or drawer on a shelf or in a cabinet

House nitrate and acetate film-base materials in chemically stable buffered paper enclosures that meet ANSI IT9.2 specifications (see Section K). House sheet film negatives in four flap seamless enclosures or envelopes with a side, rather than central, seam. If envelopes are used, insert the negatives so that their emulsion surfaces face away from the seam.

Don't use plastic materials including mylar polyester for the storage of nitrate or deteriorated acetate negatives.

10. *Why do I place color photographic collections in cold storage?*

Cold storage is the only way to preserve color photographs in their original form for long periods of time. Therefore, with valuable color collections, be sure to use humidity-controlled cold storage for originals and copies for reference and duplication purposes.

Cold stored masters should be the original, regardless of process. Duplication and viewing copies should be available so that the original images don't need to be removed from cold storage. Each generation of copies loses some image detail and has some color shift. Avoid introducing a copy as the master, because subsequent copies are apt to be too distorted.

While all color photographic materials will benefit from cold storage, according to Henry Wilhelm there are specific color photographic processes for which cold storage is particularly imperative. These include pre-1984 Ektacolor, Fujicolor, Agfacolor, and Konica Color prints; all pre-1991 Kodak Ektachrome prints; color negative films, especially Ektacolor, Vericolor II, Kodacolor-X, and Kodacolor II; and color transparency films such as Process E-1, E-2, E-3, and E-4 Ektachrome films, ANSCO and GAF films.

The majority of color slides are one-of-a-kind transparencies produced by the reversal processing of chromogenic (Kodachrome and Ektachrome) film. No negative remains. The most important factors you need to consider in determining the useful life of color slides is their inherent dye stability and resistance to stain formation during aging. Improper processing of color materials can also adversely affect image stability.

The stability of color transparency film varies considerably. Kodachrome film, for example, is clearly the most stable transparency film in dark storage, yet it has the worst projector fading stability of any slide film currently available. E-6 Ektachrome film, in comparison, will develop high levels of yellow stain during dark storage but is more stable than Kodachrome when projected.

11. *How do I determine what is appropriate cold storage?*

You can create cold storage either by using a frost-free refrigerator or by constructing a cold storage facility. The latter option is significantly more costly and only appropriate for large collections of materials for which the use of refrigerator units isn't feasible.

12. *What do I need to know about storage in a frost-free refrigerator?*

Refrigerated storage is vital for the long-term preservation of pre-1984 Ektacolor, Fujicolor, Agfacolor, and Konica Color prints; all pre-1991 Kodak Ektachrome prints; color negative films including Ektacolor, Vericolor II, Kodacolor-X, and Kodacolor II; and color transparency films such as Process E-1, E-2, E-3, and E-4 Ektachrome films, ANSCO and GAF films.

A frost-free refrigerator will effectively slow the fading rates and greatly extend the life of color photographic materials. See *TOT* for specific makes and manufacturers. Operate these refrigerators in a well-ventilated room, but not in the museum storage room. They give off a

considerable amount of heat. In the event of a power failure lasting longer than 48 hours, unplug the unit and leave the door open until the power is restored.

- ***Environmental Monitoring and Control.*** Maintain refrigerators properly. Monitor temperature and humidity levels at all times, ideally through the use of a datalogger drilled and attached to the refrigerator for external monitoring. Use conditioned silica canisters to help maintain the relative humidity. Place a separate thermometer in the refrigerator compartment where temperatures should be adjusted to 1.7°-4.4°C (35°-40°F).
- ***Fullness.*** Don't pack the refrigerator too tightly as constant air circulation is essential. You can use the vegetable and fruit storage drawers, but never place photographic collections directly on the bottom of the refrigerator compartment. Don't block the vent for forced cold air, and don't keep food and drink in the refrigerator.
- ***Housing.*** Package all color films and prints in envelopes and boxes and place them in polyethylene bags, such as heavy duty freezer Ziplock bags, or wrap them in polyethylene with all seams carefully sealed with freezer tape. Slide collections, packaged in paper or plastic boxes or slide pages, should also be sealed with polyethylene. This eliminates the need for pre-conditioning and prevents moisture condensation on the collection materials when the refrigerator door is opened or when they are removed and warmed to room temperature. Place moisture indicators inside the bags to help monitor environmental conditions.

If it is unavoidable, then carefully seal all photographs in vapor proof enclosures such as heat-sealable, aluminum foil envelopes. In doing so, precondition these materials at a low (30%-40%) relative humidity. These kinds of storage systems come with a constant risk of improper seals and punctured enclosures, so they tend to reduce, and in some cases realistically eliminate, access to the collection.

- ***Preconditioning.*** Pre-condition valuable photographs by storing them for several days at a low relative humidity for maximum safety. Keep objects in the surrounding environment several hours while they reach equilibrium with the surrounding air. Then seal them in vapor-proof envelopes and place them in the refrigerator.
- ***Retrieval Guidelines.*** Develop proper collection retrieval guidelines in consultation with a conservator. Warm-up times will vary and are dependent upon the amount of materials being removed. Don't routinely retrieve collections from cold storage. Instead, use access and duplication copies for research access and copying.

Allow a collection to warm up for 24 hours if you must retrieve it. During this time the collections should remain wrapped in polyethylene bags to prevent moisture condensation. Air should be allowed to circulate freely around the collections as they gradually warm to room temperature.

- **Refrigerator Selection.** If at all possible, don't use a freezer, or an older manual defrost or newer cycle defrost (energy saver) refrigerator. The unit should have separate refrigerator and freezer compartments. Both compartments must be guaranteed to be frost-free.
 - Cooling coils in the unit should be located only in the side of the freezer section. No part of the refrigerator or freezer that condenses moisture or forms ice crystals should be visible in the unit.
 - Air should be forced over the cooling coils and into the freezer section by an internal fan.
 - All cooling in the refrigerator section should come from cold air blown in from the freezer section by an internal fan.

13. *What do I need to know about storage in a cold storage vault?*

Because the design and construction of a cold storage vault for photographic materials requires specialized knowledge, you will need to select an experienced contractor and consult with curators, archivists, and conservators familiar with cold storage systems.

- **Environment.** For optimum protection, experts may recommend vault temperatures of -18°C (0°F) and relative humidity levels of 30%. These levels are difficult and expensive to maintain and aren't ideal in situations where collections are regularly accessed. For these reasons, many cold storage vaults in the United States are currently operating at 4.4°C (40°F) and 40% RH. Whatever the temperature, humidity cycling must be avoided in all cases.

Equip your vault with redundant and independent environmental systems in the event of equipment failure. Install air filtration systems to remove acetic acid and oxidizing gases. Outside the storage, install automatic dry-desiccant dehumidifiers with high efficiency particulate air (HEPA) filters. All cold storage vaults should have automatic shutdown systems that will activate when deviations from pre-set limits of temperature and relative humidity occur.

- **Housing.** Storage in a low temperature vault requires that the photographic materials be placed in acid-free boxes, portfolio cases, motion picture cans, and other enclosures safe for the long-term storage of photographs. Vapor-proof packaging isn't required.
- **Retrieval.** You also need to be aware that regular and constant retrieval of materials from cold vaults will directly affect their projected life expectancy. Heavily accessed materials may not benefit as significantly from storage in low temperature vaults—below -9.5°C (15°F). Therefore, be sure to make use and duplication copies of rare or fragile materials *before* placing the items in cold storage, so that the originals can fully benefit from cold storage and be preserved for a maximum lifetime.

Place packages removed from the vault in polyethylene bags and allow them to warm up gradually. Small packages, such as a single matted

color print, should have very short warm-up times and should be available for use almost immediately upon removal from cold storage.

14. *When can I remove original photographic materials from cold storage?*

Don't remove originals from cold storage except in three cases:

- power outages of longer than 48 hours
- visits by photographic researchers who are studying details of process, format, and image manipulation
- the need to replace a damaged, deteriorated, or lost copy negative

15. *How do I house color slide collections?*

Color slides not in cold storage, such as those that may be heavily used, should be enclosed in individual polypropylene or triacetate sleeves, unless kept in permanent or inactive storage. These sleeves should fit tightly around each slide so that the slides won't fall out. These sleeves aren't necessary for glass-mounted slides because glass mounts offer protection from fingerprints and scratches. Glass mounts don't reduce the rate of fading associated with dark or light storage.

You can also house slide collections in polypropylene slide pages, available in several gauges. (These pages may be used in conjunction with individual acetate sleeves.) The heavier gauge (5.0) is recommended for its superior handling characteristics. Rigid, open frame polypropylene Saf-T-Stor slide pages supplied by Franklin Distributors Corporation are also recommended. Avoid polyvinyl chloride (PVC) pages as well as low density polyethylene. Polyethylene's physical strength is inadequate and the presence of anti-block and slip agents that have been incorporated during manufacture may promote ferrotyping of the slide surfaces.

You can house large slide collections in acid-free boxes fitted with movable interior dividers or in baked-on enamel or powder-coated cabinets, but be sure that non-glass mounted slides are carefully protected from handling.

G. Preventive Conservation: Exhibiting Photographic Collections

1. *How do I exhibit photographic prints?*

The recommended environmental conditions for the exhibition of photographic print materials are identical to those for storage: 30%-50% RH and 20°C (68°F). Never exhibit photographic prints for more than four months per year.

Never place original photographic print materials on permanent display. Consider exhibiting facsimiles or copy prints where the use of original prints isn't essential.

Restrict illumination, either artificial or natural, for display of most nineteenth century photographic print materials to 50 lux (5 footcandles). This standard applies to all photographic materials which have exposed paper fibers, such as salted paper, platinum, and cyanotype; photomechanical processes, such as collotype and photogravure; and

albumen photographs. Fifty lux (5 footcandles) also is recommended for photographic prints that have applied color such as hand tinting and/or tinted binder/baryta layers. Prints with untinted baryta layers, most silver gelatin and collodion-chloride processes, may tolerate up to 100 lux (10 footcandles) exposure.

Never expose photographic materials to direct sunlight or ultraviolet radiation. If possible, use tungsten (incandescent) or fibre optic illumination instead. Incorporate filters and diffusers with all case lighting.

It's also a good practice to monitor the condition of photographic prints at frequent intervals while they are on display. Photochemical damage is usually most apparent as a difference in appearance between exposed print areas and those protected by the window mat. You can find procedures for monitoring print materials in Section K.

All framed photographs you select for exhibition should be paper hinged or photocornered into 100% neutral pH ragboard mats and glazed with ultraviolet filtering acrylic sheeting (Plexiglas). *Only* latex paints should be used to prepare walls and exhibition spaces, since the peroxides emitted during the curing of oil-base paints will accelerate silver image deterioration.

Finally, have a conservator stabilize any photographs that exhibit serious deterioration problems before exhibiting them. See *MH-I*, Chapter 8, Conservation Treatment, for guidance on conservation treatment.

2. *How do I exhibit daguerreotypes, ambrotypes, and tintypes: cased and uncased formats?*

A cased object consists of the photographic image, decorative brass mat, and cover glass. These components are usually sealed with paper tape and flexible brass preserver. The photographic images themselves aren't particularly light-sensitive (for example, a daguerreotype plate won't fade upon exposure to light). However, the dyed decorative fabrics, paper, and leather integral to case construction, as well as some of the pigments used in hand-coloring, are very susceptible to fading. Natural resin varnish layers on tintype and ambrotype surfaces may yellow upon exposure to light.

Exhibit cased objects within closed display cases at low light levels (50 lux or 5 footcandles) for limited periods of time.

You also should maintain stable temperature and relative humidity levels within these cases. A sudden rise in temperature may cause an ambrotype's black lacquer backing to irreversibly crack and craze or a daguerreotype's gilded surface to exfoliate.

3. *How do I exhibit color photographic collections?*

All color prints, with the exception of Ultrastable Permanent Color, will fade when exposed to light during exhibition. Different types fade differently with some lasting significantly longer than others. Never subject valuable or non-replaceable color prints to prolonged (more than one week) display. Use copies instead.

For most color print materials the spectral distribution of the illumination source, for example, incandescent versus fluorescent, has relatively little

effect on their fading rates. In fact, it is the intensity of illumination that is important.

Keep illumination levels low: 50 to 100 lux (5 to 10 footcandles) are frequently recommended for the exhibition of color photographic material. Also, be sure to monitor prints with a reflection densitometer prior to and following exhibition, in order to have a qualitative record of a print's original condition and the complex changes that may take place following exhibition. Consult a photograph conservator for procedural guidelines to ensure that prints aren't damaged during the monitoring process and that the results are valid.

Color images deteriorate due to inherent instability of organic dyes. Wilhelm (previously cited) identifies and categorizes these unique deterioration characteristics. The characteristics pertaining to exhibited collections are as follows:

- Fading caused by exposure to light and ultraviolet radiation during display or projection. The rate of light fading is a function of the intensity of illumination and the duration of exposure. The rate of fading is also specific to each type of color film and print material. Most Kodak Ektacolor RC prints made between 1968-1977 and displayed for extended periods of time, for example, now exhibit severe image fading and color balance shift.

The light fading characteristics of modern materials vary considerably. Most modern chromogenic color print materials have an ultraviolet-absorbing coating and, therefore, UV radiation isn't considered to be a major contributing factor to the light degradation of these materials. Most of the fading that occurs with these papers is caused by exposure to visible light. Ilford, Ilfochrome and Kodak Dye Transfer prints don't have UV-absorbing coating. These materials will be quickly and irreversibly damaged by exposure to ultraviolet radiation. Ektachrome slide film is more stable than Kodachrome when the processes experience regular exposure to light.

In general, you should carefully restrict the exhibition of original color photographic prints and, where acceptable, substitute facsimile copy prints for long-term display.

- Light-induced yellow stain formation. For most modern color materials light-induced staining is a relatively minor problem when compared with the irreversible fading of cyan, magenta, and yellow dye layers.

H. Preventive Conservation: Inspecting Photographic Collections

1. *What is the Condition Checklist for Visual Images?*

The Condition Checklist for Visual Images provides a simple way for conservators or park curators who are familiar with visual images and their conditions to record the overall condition of an image, group of images, or collection, as well as the control numbers, location within a specific collection, physical process, format, and techniques, and specific deterioration conditions.

2. *How do I use this checklist?*
- The form can be used to record this information for: a single image (for example, negative 5, of folder 9, of box 3, of collection X); a group of images (for example, negatives 43-97, of boxes 1-2, of collection X); an entire collection (for example, negatives 1-2000, of boxes 1-20, of collection X). When using the form for more than one image, check all categories that apply for that group of materials. You may need more specific data for planning purposes, such as the estimation of the amount of treatment work needed or rehousing needs. In such cases, use specific numbers to indicate the quantities of images that exhibit a specific trait (for example, brittleness 10 indicates that 10 images exhibit brittleness in the materials being evaluated).
3. *Where do I find the checklist?*
- See Figures R.3a and R.3b for the checklist. An unpunched full size checklist accompanies this appendix. Keep the full size checklist as a master and make copies for your use.

I. Conservation Treatment Issues for Deteriorated Photographic Materials

1. *What does this section cover?*
- This section describes appropriate treatments for different kinds of deteriorated photographic print materials in order to give you a sense of what will need to be done. In some cases, no treatment may be appropriate. In all cases, have a conservator treat these materials.
2. *Why use a conservator?*
- In devising a valid treatment proposal, a conservator will evaluate the physical condition and chemical composition of all components that may be incorporated into these photographic materials, including the secondary support and its method of attachment, as well as the presence of handcoloring, retouching, and/or additional varnish layers. Historic and contemporary photographic materials are composed of a wide variety of organic and inorganic compounds, synthesized into a complex, multi-layered structure. The conservator will:
- consider potential reactions and interactions of these materials to proposed conservation treatment procedures.
 - evaluate the photograph's historic and aesthetic integrity as well as the short- and long-term risks and merits of a particular treatment procedure
 - identify the purpose (exhibition versus storage) and scope (single item versus large group) of a particular treatment in order to determine the nature and extent of possible reconstruction or restoration
 - propose a viable treatment procedure to the curator that is based on all of these critical factors
3. *What are the ethical considerations?*
- An accurate discussion of current conservation treatment practice should include an acknowledgement and understanding of the ethical principles and standard guidelines that conservators follow. All conservators are bound by a Code of Ethics. See *MH-I*, Chapter 8, Conservation Treatment, and Appendix D, Code of Ethics, for a detailed discussion of

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Condition Checklist For Visual Images

Control Numbers:

Accession number(s) _____
Catalog number(s) _____
Item number(s) _____
Negative number(s) _____

Collection Name: _____

Location(s) of the Item(s) in the Collection:

Box number(s) _____
Folder number(s) _____
Item sequence number _____
Other number _____

Photographer(s): _____

Dates: _____

Physical Description:

Process(es) _____
Format(s) _____
Size(s) _____
☐ Color ☐ Monochrome
☐ Negative Transparency ☐ Print(s)
☐ Positive Transparency ☐ Drymounted
☐ Matted ☐ Framed ☐ Cased ☐ In Album
☐ Autographed ☐ Other _____

General Condition Analysis:

☐ Excellent ☐ Good ☐ Fair ☐ Poor

Specific Condition Analysis: (Check all that apply and indicate approximate quantities or percentages when dealing with large quantities)

a. Primary Support/Secondary Support:

<input type="checkbox"/> Brittleness _____	<input type="checkbox"/> Tack holes/punctures _____
<input type="checkbox"/> High acidity _____	<input type="checkbox"/> Adhesives _____
<input type="checkbox"/> Lignin content _____	<input type="checkbox"/> Tapes _____
<input type="checkbox"/> Cockling/buckling _____	<input type="checkbox"/> Discoloration _____
<input type="checkbox"/> Curling _____	<input type="checkbox"/> Waterstains _____
<input type="checkbox"/> Folds/creases _____	<input type="checkbox"/> Matburn _____
<input type="checkbox"/> Wrinkles _____	<input type="checkbox"/> Foxing _____
<input type="checkbox"/> Warp _____	<input type="checkbox"/> Mold _____
<input type="checkbox"/> Tears _____	<input type="checkbox"/> Insect/vermin accretions _____
<input type="checkbox"/> Losses _____	<input type="checkbox"/> Dirt/grime _____
<input type="checkbox"/> Holes _____	<input type="checkbox"/> Fingerprints _____

Figure R.3a. Condition Checklist for Visual Images (Sample)

Condition Checklist For Visual Images

b. Image Layer/Media:

- | | |
|---|--|
| <input type="checkbox"/> Fading _____ | <input type="checkbox"/> Emulsion bubbling or flow _____ |
| <input type="checkbox"/> Color shift _____ | <input type="checkbox"/> Binder migration _____ |
| <input type="checkbox"/> Discoloration _____ | <input type="checkbox"/> Trim _____ |
| <input type="checkbox"/> Water stains _____ | <input type="checkbox"/> Cut _____ |
| <input type="checkbox"/> Oleaginous stain _____ | <input type="checkbox"/> Tears _____ |
| <input type="checkbox"/> Silver sulfiding or tarnishing _____ | <input type="checkbox"/> Losses _____ |
| <input type="checkbox"/> Loss of highlight detail _____ | <input type="checkbox"/> Holes _____ |
| <input type="checkbox"/> Loss of dense detail _____ | <input type="checkbox"/> Adhesives _____ |
| <input type="checkbox"/> Loss of surface gloss _____ | <input type="checkbox"/> Cloth tapes _____ |
| <input type="checkbox"/> Emulsion flaking _____ | <input type="checkbox"/> Plastic tapes _____ |
| <input type="checkbox"/> Applied color flaking _____ | <input type="checkbox"/> Dirt/grime _____ |
| <input type="checkbox"/> Bleeding/feathering of applied color _____ | <input type="checkbox"/> Dust _____ |
| <input type="checkbox"/> Surface cracking/crazing _____ | <input type="checkbox"/> Smoke damage _____ |
| <input type="checkbox"/> Surface abrasion _____ | <input type="checkbox"/> Fingerprints _____ |
| <input type="checkbox"/> Embrittlement _____ | <input type="checkbox"/> Insect grazing _____ |
| <input type="checkbox"/> Media stuck to another object _____ | <input type="checkbox"/> Mouse chew _____ |
| <input type="checkbox"/> Emulsion softening _____ | <input type="checkbox"/> Insect or vermin accretions _____ |
| <input type="checkbox"/> Emulsion powdering _____ | <input type="checkbox"/> Mold _____ |
| <input type="checkbox"/> Cockling/buckling _____ | <input type="checkbox"/> Foxing _____ |
| <input type="checkbox"/> Channeling _____ | <input type="checkbox"/> Other (Describe) _____ |
| <input type="checkbox"/> Dimpling _____ | |

Additional Comments:

Figure R.3b. Condition Checklist for Visual Images (Sample)

conservation treatment and the Conservator's Code of Ethics. These codes address the critical issues of treatment practice, such as:

- In the treatment of photographic materials, all actions must be governed by respect for the integrity of the photograph including its physical, historical, aesthetic, and cultural significance. The conservator must adhere to the highest and most exacting standards.
- The conservator must restore deteriorating materials according to an understanding with the owner, custodian and, in some cases, the photographer, if living. Conservation treatment must not modify or conceal the true nature of the object. It must be detectable, although it need not be conspicuous, and must be fully documented. A conservator must use appropriate materials and techniques that will have the least adverse effects and that can be removed most easily and completely. Conservation treatment procedures must not impede future examination or treatment possibilities.

4. *What treatments will the conservator use?*

While many of the conservation treatments discussed apply to both nineteenth- and twentieth-century photographs, they do *not* apply to contemporary color materials. The complexity of modern color materials eliminates most treatment options.

It is important that these treatments be carried out by a conservator who specializes in photographic materials. Improperly done, these treatments will cause irreversible and catastrophic damage.

Practical, reversible, and predictable conservation treatment procedures for deteriorated photographic print materials are continually being developed and refined. However, many questions remain unanswered. Many objects are left untreated as informed conservators advocate restricted handling and stringent environmental control for the preservation of particularly fragile materials for which treatment isn't, at this time, an option.

- *Removal of Microorganisms*

The organic constituents of photographic materials are vulnerable to microbiological attack associated with upper extremes of temperature and relative humidity. The most effective treatment in all but the most severe cases is modification of the environment and removal of the mold growth from the affected item by using a vacuum aspirator or tweezers.

Mold removal may yield a fragile and disfigured surface, requiring careful consolidation and inpainting by a conservator. Primarily because of their potential toxicity and chemical reactivity, the use of fungicides or fumigants in the treatment of mold-damaged photographic materials has been curtailed radically. See *COG 3/4*, Mold and Mildew: Prevention of Microorganism Growth in Museum Collections, for guidance on monitoring and controlling the environment to prevent microorganism growth in collections.

- *Consolidation of Flaking Binder Layers*

In some cases, photographic images will exhibit moderate to severe flaking of their binder layer, thus requiring immediate consolidation by a conservator. (Consolidation is the application of an adhesive to improve cohesion between a deteriorated binder layer and its substrate.)

Consolidation techniques also may incorporate the use of aqueous or non-aqueous solutions, the choice of which is typically dependent on the physical and chemical compatibility of the consolidant and its selected solvent with the deteriorated binder layer. The use of solvent-soluble adhesives such as acrylic resins, for example, may not be appropriate for the consolidation of a deteriorated collodion binder layer. Likewise, the high pH of acrylic dispersions, often ranging from 8.0 to 9.0, may prove problematic for use with proteinaceous binders. The conservator will also need to evaluate any additional properties, such as long- and short-term reversibility, flexibility, adhesive strength, chemical reactivity, and the possibility for irreversible visual alteration.

- *Reduction of Surface Dirt*

Photographic images exhibiting embedded dirt and grime may be carefully surface cleaned after a conservator has thoroughly evaluated the possibility for physical or chemical damage, as well as permanent alteration in surface reflectance or gloss. Conservators employ a variety of materials and techniques in an attempt to reduce dirt and grime layers effectively from photographic surfaces. These include soft brushes, non-sulphur-containing crumbled vinyl erasers, distilled water and organic solvent solutions applied with cotton swabs and/or balls.

Severe structural damage to a binder layer may prevent dirt removal. This is often true of deteriorated albumen photographs, in which the egg white binder is severely cracked and crazed. The conservator must be extremely careful when cleaning photographs in which the final image material is embedded in the paper support, such as salted paper or platinum prints, as these images are abraded easily.

On film-based negatives and transparencies and slides, park staff may use compressed air available in aerosol cans (for example, Dust-Off, Omit) to reduce surface dirt. This procedure should be performed under the guidance of a conservator and only on film in good condition with no evidence of physical damage. Some aerosol canned products contain oily gray substances. Test first by spraying on a white blotter.

Photographic materials that have accumulated a lot of surface dirt and dust may require immediate attention by a conservator, who will safely remove superficial loosely attached dirt with a dry, soft brush.

- *Removal of Tapes and Adhesives*

In order to safely remove paper hinges, residual adhesives, and pressure-sensitive tapes from a photograph's surface, a conservator may use direct or indirect moisture vapor, methyl cellulose poultices, aqueous solutions, organic solvents, and many other accepted paper conservation techniques.

- *Removal of Poor-Quality Secondary Supports*

The vast majority of historic photographic prints were mounted during manufacture, with mounts usually consisting of a poor-quality lignin-core board sandwiched between two thin, high-quality papers. Lignin decomposition products may react with proteinaceous materials such as albumen or gelatin, producing a highly colored compound and/or emitting oxidants such as peroxides and causing silver and dye image materials to fade and discolor. In addition, these secondary supports are often acidic and embrittled, posing serious structural danger to the photographs themselves. If this is the case, use extreme care in handling these fragile materials, and consider conservation treatment.

If undertaking treatments of this type, the conservator will consider the historic and aesthetic integrity of the photographs's secondary support. Through careful visual and microscopic examination, the conservator will evaluate the possible deleterious effects associated with the mounted photograph's adhesive and secondary support material, as well as the sensitivity of the photograph's component structure to possible physical or chemical damage during treatment.

Typical backing removal techniques involve mechanical removal, the local application of moisture vapor or steam, and/or immersion in aqueous or organic solutions. Treatment choice will be dictated by the photograph's structural and chemical condition. Inadequately hardened gelatin prints, for example, may swell dangerously when exposed to moisture. Exposure to moisture via surface cleaning, humidification or immersion will likely cause albumen binder layers to crack and craze, with a resultant loss of surface gloss. Many albumen and silver gelatin photographic prints, therefore, may require absolutely dry techniques, such as the use of metal or Teflon spatulas, for the safe removal of their deteriorated secondary supports.

- *Humidification and Flattening*

Humidification and flattening of rolled, cockled or warped photographic prints are critical operations that, if done incorrectly, may induce dimensional instability, irreversible damage to a binder layer, and/or irreversible staining in the photograph's primary support. However, a conservator can develop treatment strategies for the humidification and flattening of curled photographic prints and, in some cases, park staff can be trained to carry out these procedures as well.

- *Chemical Treatment*

An issue of considerable importance and active debate in the photograph conservation field today is the use of chemical treatment. The dire consequences of ill-advised treatments can't be ignored. For this reason, most practicing conservators agree that many chemical treatments, such as the bleach and redevelopment of faded silver images, particularly on fine art photographs, require more research before use.

- *Structural Repair*

Photographic prints exhibiting creases, tears, losses, and other structural damages may be mended by a conservator utilizing accepted paper conservation techniques. In most cases, the conservator can mend tears successfully by using the appropriate weight Japanese paper combined with wheat starch, gelatin, or methyl cellulose adhesive.

- *Remounting of Photographic Prints*

Photographic prints that have been removed from their mounts during treatment may require lining or remounting in an attempt to stabilize, consolidate, strengthen, and facilitate handling for exhibition and/or storage.

In selecting the appropriate mounting technique, the conservator will consider a variety of factors pertaining to the photograph's condition and appearance prior to and following mounting. The conservator must take into account the potential for cracking or crazing of an albumen binder layer, for example due to the expansion and contraction of a wet secondary support. This may occur in many currently practiced remounting techniques.

Methods used by conservators to remount photographic prints include:

- line unmounted photographs directly onto Japanese papers or rag papers and boards using methyl cellulose or wheat starch adhesives
- line a humidified photograph with Japanese paper and wheat starch paste onto a sheet of unbuffered two- or four-ply ragboard that has been counterlined on the reverse to minimize warpage
- adhere the unmounted photograph onto a smooth-surfaced rag paper with wheat starch or methyl cellulose adhesive

The polyester fabric or "Dacron," which is then pasted onto sanded Plexiglas, acts to hold the photograph's secondary support under tension and is removed following drying.

The latter technique may be particularly suitable for the mounting of larger collections or holdings of photographic prints, as the cost of materials and time requirements can be minimized.

Each of these mounting techniques has distinct advantages and disadvantages. Discuss the ramifications associated with each of these options with your conservator.

- ***Compensation of Losses***

Following remounting, a conservator may inpaint abrasions, scratches, tear edges, and other disfiguring damage in a photograph's surface by using a variety of media, including watercolors, ground pigments in acrylic resins, and pastel pencils. In all instances, the conservator will first evaluate the long-term aging characteristics of the selected media and their "compatibility" with the damaged photograph in terms of chemical reactivity, solubility parameters, and surface qualities. The extent of compensation should also be discussed and agreed upon in collaboration with the curator or collection manager.

J. The Recovery of Water-Damaged Photographic Materials

See *MH-I*, Chapter 10, Museum Collections: Emergency Planning for guidance on emergency planning, and to Chapter 8, Conservation Treatment, for general rules on appropriate response to emergency situations involving museum objects.

1. *How should I recover water-damaged materials?*

If at all possible, water-soaked photographic materials should be air-dried, laid flat on a clean surface or hung on a line with clips that won't leave indentations (not binder clips). If you can't air-dry these materials, due to lack of personnel, facilities, and/or time, freeze them and then thaw and air-dry them later. Don't freeze glass plates or lantern slides.

Vacuum freeze-drying is the next preferable alternative. In this system place the photographs in a vacuum chamber either wet or frozen. The vacuum is pulled, a source of heat introduced, and the photographs, which dry at temperatures below 0°C (32°F), remain frozen until dried. Vacuum freeze-drying may result in a significant loss of gloss and/or a strong tendency to curl. The tendency to curl may be overcome by careful humidification following freeze-drying. In all cases, *avoid vacuum thermal-drying* whereby photographic materials are dried at temperatures above 0°C (32°F). As a result, photographic binder layers will have a strong tendency to block or stick together irreversibly. Don't vacuum freeze dry glass plates or lantern slides.

If photographs have been immersed in dirty water, a disaster recovery team should carefully wash them in changes of cold, preferably distilled, water prior to air-drying or freezing. Carefully monitor the condition of the photographs to ensure that binder layers or original ink annotation on mounts aren't being damaged. Some color processes may require bathing in a stabilizer prior to air-drying. Consult a conservator.

2. *What should I salvage first?*

In general, black-and-white photographic prints appear to be more resistant to water damage than contemporary color materials. Photographic film-base negatives are more resistant to deterioration than print materials. Depending upon the collection priority, you may want to salvage color materials first.

Mold grows after 48 hours above 65% RH and 21°C (70°F). Emulsions soften and stick if not separated during the drying process. During salvage, rescue the following first: silver gelatin processes (prints, negatives, and transparencies), glass plates, lantern slides, ambrotypes, daguerreotypes, color materials and acetate and nitrate film base. Albumen processes, collodion prints, salted paper prints, cyanotypes, and platinum prints can be done last.

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ANSI IT9.11-1991 (Safety Film Storage)
ANSI/NAPM IT9.11-1993 (Storage of Photographic Film)

ANSI/NAPM IT9.16-1993 (Photographic Activity Test)
ANSI IT9.20-1994 (Storage of Photographic Prints)
ANSI/NAPM IT9.18-1994 (Storage of Photographic Plates)
ANSI PH1.51-1990 (Photo & Micrographic Film Dimensions)
ANSI/ASC OG4.8-1985 (Residual Thiosulfate)

These items are available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, 212-642-4900; or from the Association for Information and Image Management, 1100 Wayne Avenue, Suite 1100, Silver Spring, MD 20910, 301-587-8202.

FULL SIZE CONDITION CHECKLIST

- **This full size Condition Checklist for Visual Images is for your use.**
- **Save as a master set.**
- **Copy as needed.**

Condition Checklist For Visual Images

Control Numbers:

Accession number(s) _____
 Catalog number(s) _____
 Item number(s) _____
 Negative number(s) _____

Collection Name: _____

Location(s) of the Item(s) in the Collection:

Box number(s) _____
 Folder number(s) _____
 Item sequence number _____
 Other number _____

Photographer(s): _____

Dates: _____

Physical Description:

Process(es) _____
 Format(s) _____
 Size(s) _____

<input type="checkbox"/> Color	<input type="checkbox"/> Monochrome
<input type="checkbox"/> Negative Transparency	<input type="checkbox"/> Print(s)
<input type="checkbox"/> Positive Transparency	<input type="checkbox"/> Drymounted
<input type="checkbox"/> Matted <input type="checkbox"/> Framed <input type="checkbox"/> Cased	<input type="checkbox"/> In Album
<input type="checkbox"/> Autographed	<input type="checkbox"/> Other _____

General Condition Analysis:

☐ Excellent ☐ Good ☐ Fair ☐ Poor

Specific Condition Analysis: (Check all that apply and indicate approximate quantities or percentages when dealing with large quantities)

a. Primary Support/Secondary Support:

<input type="checkbox"/> Brittleness _____	<input type="checkbox"/> Tack holes/punctures _____
<input type="checkbox"/> High acidity _____	<input type="checkbox"/> Adhesives _____
<input type="checkbox"/> Lignin content _____	<input type="checkbox"/> Tapes _____
<input type="checkbox"/> Cockling/buckling _____	<input type="checkbox"/> Discoloration _____
<input type="checkbox"/> Curling _____	<input type="checkbox"/> Waterstains _____
<input type="checkbox"/> Folds/creases _____	<input type="checkbox"/> Matburn _____
<input type="checkbox"/> Wrinkles _____	<input type="checkbox"/> Foxing _____
<input type="checkbox"/> Warp _____	<input type="checkbox"/> Mold _____
<input type="checkbox"/> Tears _____	<input type="checkbox"/> Insect/vermin accretions _____
<input type="checkbox"/> Losses _____	<input type="checkbox"/> Dirt/grime _____
<input type="checkbox"/> Holes _____	<input type="checkbox"/> Fingerprints _____

Condition Checklist For Visual Images

b. Image Layer/Media:

- | | |
|---|--|
| <input type="checkbox"/> Fading _____ | <input type="checkbox"/> Emulsion bubbling or flow _____ |
| <input type="checkbox"/> Color shift _____ | <input type="checkbox"/> Binder migration _____ |
| <input type="checkbox"/> Discoloration _____ | <input type="checkbox"/> Trim _____ |
| <input type="checkbox"/> Water stains _____ | <input type="checkbox"/> Cut _____ |
| <input type="checkbox"/> Oleaginous stain _____ | <input type="checkbox"/> Tears _____ |
| <input type="checkbox"/> Silver sulfiding or tarnishing _____ | <input type="checkbox"/> Losses _____ |
| <input type="checkbox"/> Loss of highlight detail _____ | <input type="checkbox"/> Holes _____ |
| <input type="checkbox"/> Loss of dense detail _____ | <input type="checkbox"/> Adhesives _____ |
| <input type="checkbox"/> Loss of surface gloss _____ | <input type="checkbox"/> Cloth tapes _____ |
| <input type="checkbox"/> Emulsion flaking _____ | <input type="checkbox"/> Plastic tapes _____ |
| <input type="checkbox"/> Applied color flaking _____ | <input type="checkbox"/> Dirt/grime _____ |
| <input type="checkbox"/> Bleeding/feathering of applied color _____ | <input type="checkbox"/> Dust _____ |
| <input type="checkbox"/> Surface cracking/crazing _____ | <input type="checkbox"/> Smoke damage _____ |
| <input type="checkbox"/> Surface abrasion _____ | <input type="checkbox"/> Fingerprints _____ |
| <input type="checkbox"/> Embrittlement _____ | <input type="checkbox"/> Insect grazing _____ |
| <input type="checkbox"/> Media stuck to another object _____ | <input type="checkbox"/> Mouse chew _____ |
| <input type="checkbox"/> Emulsion softening _____ | <input type="checkbox"/> Insect or vermin accretions _____ |
| <input type="checkbox"/> Emulsion powdering _____ | <input type="checkbox"/> Mold _____ |
| <input type="checkbox"/> Cockling/buckling _____ | <input type="checkbox"/> Foxing _____ |
| <input type="checkbox"/> Channeling _____ | <input type="checkbox"/> Other (Describe) _____ |
| <input type="checkbox"/> Dimpling _____ | |

Additional Comments:

Appendix S: Curatorial Care of Objects Made From Leather and Skin Products

	<u>Page</u>
A. Overview	S:1
What information will I find in this appendix?	S:1
Why is it important for me to practice preventive conservation with these objects?	S:1
How can I find the latest information on care of these types of materials?	S:1
B. The Nature of Leather and Skin Products	S:2
What is the structure of skin?	S:2
How is animal skin processed?	S:3
How do I recognize different species?	S:3
C. Agents of Deterioration	S:7
What is the threat of biological infestation?	S:7
How do I prevent pest problems?	S:8
What about the loss of hair and fur?	S:8
How can I stop hair and fur loss?	S:9
What is the threat of thermal reaction?	S:9
How can I minimize the threat of thermal reactions?	S:9
What about water and moisture damage?	S:10
What are the measures for limiting water and moisture damage?	S:10
What is the threat of prolonged exposure to oxygen?	S:11
How can I minimize these oxidation reactions?	S:11
What about pollutants?	S:11
How can I minimize the effects of pollutants?	S:11
What harm can light cause?	S:11
How can I minimize the effects of light?	S:12
D. Preventive Conservation: Guidelines for Leather and Skin Object Care, Handling, and Storage	S:12
How do I provide a stable and appropriate humidity?	S:13
How do I monitor the condition of objects?	S:13
How do I clean objects?	S:13
How do I handle skin and hide materials?	S:14
What about catalog labeling?	S:14
How do I provide adequate physical support for objects?	S:16
How do I store objects properly?	S:16
E. Summary: Leather and Skin Product Deterioration and Preventive Care	S:19
F. Conservation Treatment Issues	S:20
What are the perils of saddle soap?	S:20
What are the drawbacks of leather dressings?	S:20
What about neutralization of acids?	S:21
G. Selected Bibliography	S:22
List of Figures	
Figure S.1 The Structure of Skin	S:2
Figure S.2 Degrees and Types of Tannage	S:3
Figure S.3 Characteristics of Leather and Skin Products	S:4
Figure S.4 Thickness of Skins and Hides	S:5

List of Figures (continued)

Figure S.5	Cleaning Techniques for Leather and Skin Objects in Good Condition	S:15
Figure S.6	Constructing a Saddlemount	S:18
Figure S.7	Leather and Skin Product Deterioration and Preventive Care	S:19

APPENDIX S: CURATORIAL CARE OF OBJECTS MADE FROM LEATHER AND SKIN PRODUCTS

A. Overview

1. *What information will I find in this appendix?*

You will find the National Park Service's present understanding of objects made of leather and skin products. You also will learn about preventive care for these objects including:

 - agents of deterioration posing the greatest threat to these objects
 - measures for preventing or minimizing the impact of these agents
 - techniques for handling, marking, and cleaning these objects
 - methods and techniques for improving storage and exhibit conditions
 - methods for monitoring the condition of these objects
2. *Why is it important for me to practice preventive conservation with these objects?*

Advancements in the treatment of leather and skin products have not kept pace with the progress made in conserving other kinds of museum objects. The conservation field only can offer limited solutions to the problems facing objects made of leather and skin. Conservators and the scientific community have begun to focus more specifically on developing new treatment strategies for the preservation of leather and skin. While new information is provided as it becomes available, you need to practice sound preventive conservation now because:

 - preventive measures stabilize objects and leave opportunity for appropriate future interventive treatments
 - conservators can only offer limited treatment solutions

Conservators discourage traditional interventive treatments, such as the application of saddle soaps and dressings. *Avoid interventive conservation treatment of leather and skin objects whenever possible.*

See NPS Museum Handbook, Part I (MH-I), Chapter 3, Museum Objects Preservation: Getting Started, for a discussion of preventive conservation and conservation treatment.
3. *How can I find the latest information on care of these types of materials?*

Refer to the following sources for new information and techniques:

 - NPS *Conserve O Gram* series
 - e-Mail NPS *Museum Management Newsletter*

B. The Nature of Leather and Skin Products

The skins and hides from vertebrates constitute the class of natural materials called skin products. Leather is one type of skin product that is produced by a particular tanning process. Processed and unprocessed animal skins have supplied the basic fabric for making utilitarian and decorative objects since prehistoric times. You will often find these materials in art, history, ethnology, and science collections.

1. *What is the structure of skin?*

Animal skin is a fibrous layer of living tissue that protects an organism from the elements. Figure S.1 illustrates its structure.

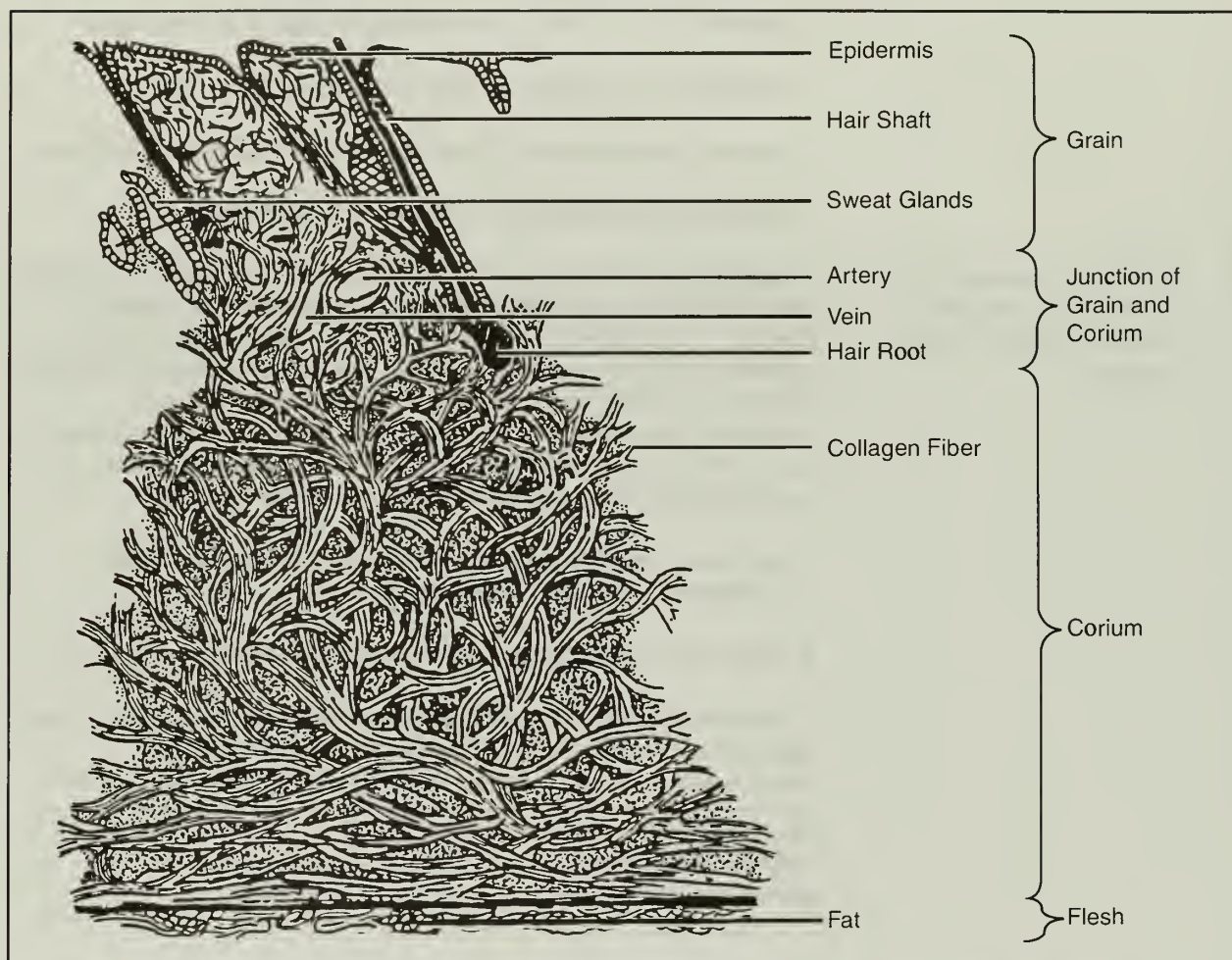


Figure S.1. The Structure of Skin

Once removed, an unadulterated skin is a proteinaceous sheet containing hair, sweat glands, fat and blood vessels, as well as its basic constituent of collagen fibers. These protein fibers are composed of coil-like molecules built of tiny fibrous strands that are twisted together, then aligned side by side overlapping one another, much like cotton fibers are arranged in a textile yarn. (To prevent separation of the cotton fibers the yarn is twisted during manufacture to produce a strong and usable thread.)

2. *How is animal skin processed?*

Animal skin can be tanned and untanned. Examples of untanned skin include rawhide, parchment, and vellum. Stable skin is processed by chemically binding fibers together, commonly referred to as tanning. The amount and type of bonding that occurs within a skin establishes its "degree of tannage." The term "leather" refers technically only to the fully tanned skin products. Figure S.2 describes degrees and types of tannage of most skin and leather objects in park collections.

Un-tanned	Semi-tanned	Native-tanned	Fully-tanned
rawhide parchment vellum	oil tannage alum tannage	smoke tannage brain tannage oil tannage	vegetable tannage mineral tannage combination tannage

Figure S.2. Degrees and Types of Tannage

People have preserved or "tanned" skin products in many ways to render them strong, insoluble, and more resistant to temperature and moisture. Nearly all of the methods of skin processing techniques used by skin and leather workers throughout the ages achieve some degree of tannage. Many of these procedures rely on mechanical properties more heavily than chemical tanning, such as the softening that results from introducing oils.

Unfortunately, determining an object's original manufacture requires considerable study. While laboratory treatments vary for different types of skins and leathers, *preventive conservation procedures are similar for most of these materials*. Your familiarity with the general skin processing categories can be very useful since these methods are responsible for many of the object's functional characteristics. See Figure S.3 for physical characteristics of these products.

3. *How do I recognize different species?*

The skin or hide of each animal species is recognizable by its physical characteristics. The principle variations among animal types are the size, density and distribution of the animal's hair, which gives rise to a distinctive grain pattern.

The relative thickness of hide and skin products is traditionally measured in "ounces." Each ounce represents 1/64 of an inch. The black solid lines in Figure S.4. represent the thickness of leather being measured.

CHARACTERISTICS OF LEATHER AND SKIN PRODUCTS								
	RAWHIDE	OIL TANNAGE	ALUM TANNAGE	SMOKE TANNAGE	BRAIN TANNAGE	VEGETABLE TANNAGE	MINERAL TANNAGE	
TANNING MATERIAL	No Tannage Applied	Cod Liver Oil and Other Oils	Alum or Aluminum Sulphates or Chlorides	Aldehydes from Wood Smoke	Animal Brains	Extracts of Wood Chips, Bark, Leaves, Roots, Fruit	Chromium Sulphates or Chlorides	
COLOR AFTER TANNAGE	White to Yellow	Dull Yellow	White	Yellow to Yellow/Brown	White to Yellow	Yellow/Orange to Light Brown	Bluish White to Pale Green	
EFFECT OF WATER	Stiffens, Dissolves, Turns Transparent	Water Absorbed, Tan Stable	Stiffens, Water Removes Tan	Water Resistant	Stiffens, Water Absorbed	Water Absorbed, Water Removes Tan Slowly	Water Absorbed, Tan Stable	
TYPICAL USES	Saddle Trees, Drumheads, Scabbards	Gloves, Wettable Leathers	Gloves, Pelts and Furs, Book Bindings	Native American Clothing, Lodges	Native American "Buckskin" Clothing and Objects	Shoe Soles, Saddles, Book Bindings	Clothing, Shoe Uppers	

Figure S.3. Characteristics of Leather and Skin Products

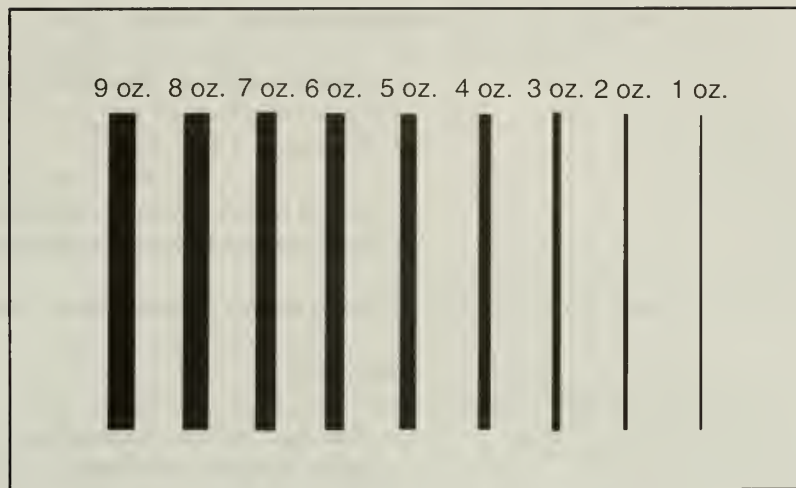


Figure S.4. Thickness of Skins and Hides

The characteristics and uses of common animal skins and hides are listed below.

Cow Hide

- Grain/hair pattern: pebbly, pronounced with large, equidistant hair spacing
- Thickness: 2 to 20 ounces
- Processing note: often split into several pieces
- Special feature: very durable, excellent for tooling and carving
- Uses: shoe soles, belting, trunks, clothing

Calf Skin

- Grain/hair pattern: same as cowhide only smaller
- Thickness: 1.5 to 4 ounces
- Special feature: greater uniformity and fineness than cowhide
- Uses: upholstery, shoe uppers, clothing, bookbindings

Bison Hide

- Grain/hair pattern: similar but less uniform than cattle
- Thickness: 5 to 20 ounces
- Special feature: loose-knit fibers on flesh side; very large hide size; stiff hump between shoulders
- Uses: 19th century boots, sleigh blankets, Native American shields, robes, clothing, tipis

Horse Hide

- Grain/hair pattern: resembles cow hide but less dense
- Thickness: 3 to 7 ounces
- Special feature: strength, texture and thickness are inferior to cow hide; compact fibers, especially in butt region
- Uses: whips, aprons, base for enameled leathers, trunks

Deer Skin

- Grain/hair pattern: large follicles form definite single rows; closely spaced fine hairs are similar to goat skin
- Thickness: 2 to 9 ounces
- Processing note: hairs are sometimes left on
- Special feature: loose structure (like sheep) results in a very stretchy leather
- Uses: parchment, gloves, clothing; Native American clothing, moccasins, containers

Sheep Skin

- Grain/hair pattern: linear groupings of large and small groups
- Thickness: 1.5 to 3 ounces
- Special feature: weaker, less durable skin (loose interweave of fibers); loosened texture (fibers run parallel to skin surface)
- Uses: suede leathers, bookbindings, jackets, gloves, chamois

Goat Skin

- Grain/hair pattern: groupings of three coarser hair follicles with closely spaced fine hair follicles
- Thickness: 2 to 3 ounces
- Special feature: close-knit collagen fibers; more durable and stronger than sheep skin
- Uses: linings, billfolds, shoe uppers

Pig Skin

- Grain/hair pattern: very coarse hairs are sparsely distributed in groups of three
- Thickness: 3 to 4 ounces

- Special feature: high fat cell content produces tough but spongy leather; very rough surface; limited water resistance
- Uses: shoes, bags, gloves, pants

Exotic Leathers

Reptile

- Special feature: surface patterns distinguish reptile type: crocodile, alligator, snake, or lizard
- Special feature: light, thin, grainless leathers often are made from bellies

Fish

- Special feature: structure is different from mammals but scales are comparable to hair on mammals

Seal

- Special feature: proportionally stronger than other leather materials; fur is left on for coats, fur is removed from base for enameled leather

C. Agents of Deterioration

The ways that skin products deteriorate can be identified and categorized. The interdependency of these mechanisms cannot be overstated. For example, temperature changes directly affect a skin or hide's moisture content, the rate at which chemical deterioration proceeds, and the object's susceptibility to biological infestation.

1. What is the threat of biological infestation?

A great variety of biological organisms are attracted to skin and hide products making these materials subject to quick and irreversible damage or total destruction. For example, insects are frequently attracted to the oils present in skin products as well as surface soils. Also, poorly cleaned materials are particularly attractive as a nutrient material for insects and microorganisms, as are all items made from rawhide.

Most insects prefer skin products made from fur and unborn animal skins. The most frequent infestations involve dermestid beetles and clothes moths, but other beetles and moths also attack skin and fur on occasion, as do silverfish and cockroaches.

Insect development usually relies on higher levels of humidity and temperature.

Since skin products are acidic in nature, microbic deterioration of skin products is generally limited to molds and occasionally bacteria. This deterioration is primarily due to environmental factors such as high humidity (above 65% RH) and a wide temperature range (in most cases 10°-40°C [50°-104°F]). These organisms produce organic acids and enzymes that bleach and stain the skin. Fungal growths are often characterized by a white, grey or green fuzzy appearance. These

growths occur most commonly on objects made from rawhide and on those skin products that have become heavily soiled.

2. *How do I prevent pest problems?*

Here are some measures to prevent or minimize biological infestation:

- Monitor all areas of the museum continually and systematically to identify insect and microbial problems at an early stage. Use insect monitoring traps and routinely inspect objects for frass, nesting materials and damage. See *MH-I*, Chapter 5, Biological Infestations, for guidance on developing a museum Integrated Pest Management (IPM) Program.
- Identify dead or living pests that you suspect of attacking skin objects.
- Develop a pest control program that includes a designated staff coordinator, with guidelines for preventive and emergency measures. Its focus should be pest control through good housekeeping and modifying the environment.
- Minimize microbiological attack of skin products by keeping relative humidity below 65% and by keeping areas clean.
- Never apply insecticides and fungicides directly to hide artifacts because they can damage the objects, complicate long term preservation, and contaminate the material for future handling and study.
- Gaseous fumigation methods available for skin and hide materials are few and require coordination by a conservator. In addition, contact the park, center, or your IPM coordinator prior to pesticide use. Technology is constantly changing and the coordinator will have access to the latest and most appropriate solutions. Your IPM coordinator must authorize and approve all pesticide use before application.

Non-toxic means of extermination such as freezing are preferable. See NPS Conserve O Gram 3/6, An Insect Pest Control Procedure: The Freezing Process, for guidance on the technique of freezing for controlling pest infestations.

3. *What about the loss of hair and fur?*

The loss of hair and fur from skins and hides not only devalues an object, but also can destroy its potential usefulness. The causes of hair or fur loss are complex and usually depend on the form and structure of the animal, the hide's original processing techniques, and the environmental conditions to which it has been subjected.

There are numerous types of hair loss:

- Epidermal slippage: hair is lost as the epidermal layer separates from the dermal layer.
- Deterioration of the individual hair follicles: hair roots become loose and hair falls out.

- Hair shaft breakage: mechanical damage weakens the hair and it breaks at its base.
- Biological attack: insects feed on the hair itself or epidermal layer, resulting in the hair being severed.

You can't do much about hair loss that is due to insufficient fixing during processing, but you can control many of the other causes, such as high temperatures, low relative humidity, photochemical degradation, and insect damage.

4. *How can I stop hair and fur loss?*

To limit the loss of hair and fur:

- Minimize the exposure of fur or hair products to lighting; illuminate only to the minimum level necessary to see the object. Recommended levels are 50 lux (5 footcandles) or less.
- Minimize handling.
- Stabilize the relative humidity and temperature to which hides with hair and fur are exposed. Don't expose them to rapid changes of either temperature or humidity and protect them from desiccation.
- Routinely inspect hair and fur products for insect damage. Remove loose or broken hair by brushing and vacuuming, and store materials in insect-proof containers such as metal museum storage cabinets with door gaskets.

5. *What is the threat of thermal reaction?*

Skin and leather products are thermosensitive. Skin tissue has a heating threshold, or point of thermal contraction, which is referred to as its shrinkage temperature. For newly processed skins and hides, this point is frequently between 60°-75°C (140°-167°F). However, the shrinkage temperature of degraded hides of aged objects can be considerably lower.

Heating dries out, embrittles, and deforms skin and leather objects. Changes in temperature also can destabilize relative humidity levels. Exhibit lighting, direct sunlight, and proximity to heating registers and radiators can easily damage leather and skin objects, which also become more sensitive to heat as they age.

Elevated temperatures cause eventual damage not only by speeding up the chemical deterioration processes, but by causing unstable fats and oils to come to the surface where they often deposit as unsightly spews. Spews (also spelled spues) are surface deposits of solidified fats and oils that exude from the interior of the leather/skin material. They appear as a white crystalline deposit or as a whitish bloom. Desiccation can also result from over-heating.

6. *How can I minimize the threat of thermal reactions?*

Try these preventive measures to minimize thermal reaction:

- Safeguard skins from exposure to warm, moist air. The acceptable minimum and maximum temperature levels are from just above freezing to 20°C (70°F).

- Reduce the damaging effect of heat cycling by placing objects away from external building walls, exterior doors and windows, exposed pipes, heating and air conditioning vents, direct sunlight, exhibit lighting sources, and locations such as hot attic spaces.

7. *What about water and moisture damage?*

While skin materials have a great affinity for water, inappropriate levels of atmospheric moisture or direct wetting usually cause serious damage. The direct wetting of skin products initiates deterioration because these materials have only a limited degree of water resistance. Rawhide, parchment and vellum are most prone to damage. Aged objects made of full-tanned leather are also highly susceptible to stiffening and darkening from wetting.

All animal materials readily absorb moisture from the air. Excessive moisture (levels above 65% RH) causes swelling of the skin's fibers and encourages biological infestation. Excessive dehydration (humidity levels below 22% RH) forces the skin to give up moisture permanently, which results in shrinkage and deformity.

Dehydration reduces the skin's ability to take up and hold moisture, thus weakening it and dramatically decreasing its flexibility. Repeated exposure to moist and dry cycles will, eventually, physically stress the hide's fibers enough to induce mechanical damage and increase its susceptibility to chemical deterioration. The hide's soluble components are frequently displaced, leached, or deposited on the surface resulting in the alteration of physical characteristics.

When skin material is subjected to either excessive moisture or high humidity in conjunction with heat and acid conditions, its chemical structure is attacked, causing shrinkage and embrittlement. If allowed to continue, the skin will lose its structure and become gelatinous. The boiling of skin to produce gelatin or hide glue is an example of this process.

8. *What are the measures for limiting water and moisture damage?*

To minimize water and moisture damage:

- Keep hide materials dry by protecting them from wetting and exposure to relative humidity levels above 65%. House objects in water-resistant containers, such as storage cabinets and exhibit cases. Whenever possible, include moisture absorbing materials to buffer enclosed spaces against extreme fluctuation of RH. These materials may include commercially-available buffers such as cotton or linen cloth, acid-free paper products, or silica gel. See *MH-I*, Appendix I, Curatorial Care of Archeological Objects, for a discussion of the use of silica gel.
- Control the relative humidity to conform to the recommended levels suitable for the collection's circumstances. Stabilize humidity fluctuation to the recommended range of 40-60% RH. Normally, you will regulate humidity through the central air-handling system, but you also can use localized and portable sources of humidification/dehumidification to protect objects from unnecessary damage.
- If you discover mold on objects made of leather or skin, consult a conservator regarding vacuum cleaning and disinfectant procedures.

9. *What is the threat of prolonged exposure to oxygen?*
- For organically-based materials like skin products, prolonged exposure to oxygen is one of the more serious and avoidable chemical factors that causes deterioration and is responsible for altering both the skin's chemical structure and many of its tanning compounds.
- Its long-term effects include the hardening of skin and hide material, embrittlement, cracking and crazing of the skin surface and overall yellowing or darkening as well as a number of serious internal structural changes. Oxidative degradation is caused by high temperatures and humidities and exposure to light radiation.
10. *How can I minimize these oxidation reactions?*
- By taking the following preventive measures:
- While it is impractical to keep most of these materials from being exposed to oxygen, if an object is extremely rare, consult with a conservator about storage and display in a hermetically sealed container filled with inert gas (such as nitrogen or helium).
 - Don't expose hide materials to excessive humidity or heat. Use air conditioning, storage design and exhibit design to eliminate the detrimental effects of these environmental stimulants of oxidation.
 - Reduce the level of visible light to the minimum required and eliminate exposure to ultraviolet light.
11. *What about pollutants?*
- The threatening forms of pollutants to skin products are particulate and gaseous pollutants. Particulates are solids that are suspended in air and range in composition from inorganic to organic. Because skin has such a porous and absorbent surface, these solid foreign materials easily work their way into the fibrous network of skin products causing soiling, staining and eventual stiffness.
- Little data is available regarding the effect of gaseous pollutants on skin but it is probable that oxidant, acidic and sulphating gases play some role in the deterioration process. Native-tanned and semi-tanned materials seem relatively more resistant than do commercial, vegetable-tanned leathers. It is likely that pollutants promote oxidation, hydrolysis and overall discoloration.
12. *How can I minimize the effects of pollutants?*
- To minimize their effects:
- Modify the building's central air conditioning and filtering system. Various filters can trap different size particles, and effectively remove gaseous contaminants.
 - Exhibit and store your objects in tightly sealed enclosures constructed of the highest quality inert materials. Install specialized pollutant absorbers with individual storage cabinets.
13. *What harm can light cause?*
- Light is an important factor in the process that degrades skin products. Its damage is cumulative and irreversible.
- Certain wavelengths break down polymeric bonds and are detrimental to all skin materials. The ultraviolet range of light is one of the most

dangerous wavelengths for skin products; however, visible light also causes structural damage and color change.

Light can act as a catalyst when oxygen, water vapor and various pollutants in the atmosphere combine to increase the rate of deterioration. The rate of degradation is generally related to the intensity and length of light exposure. Fading of smoked and pigmented hides is a particular problem where prolonged light exposure is involved.

14. *How can I minimize the effects of light?*

Take these preventive measures:

- Minimize the exposure of skin materials to visible light; illuminate only to the minimum level necessary to see the object. Recommended maximum levels are 150 lux (15 footcandles) for most materials and 50 lux (5 footcandles) for painted skins and hides with fur.
- Eliminate ultraviolet (UV) radiation through the use of UV absorbing filters installed between the light source and the artifact or on the light source itself. Select lighting systems with low proportions of UV radiation. The maximum acceptable proportion of UV radiation is 75 microwatts per lumen.
- Maintain stored objects in darkness. Ensure that unfiltered light does not reach stored skin and hide materials.
- Monitor and adjust lighting fixture locations and light bulb wattage individually. Use timers and dimmers for controlling light in exhibits.

See MH-I, Chapter 4, The Museum Environment, for general guidance on temperature, relative humidity, light, and pollution.

**D. Preventive Conservation:
Guidelines for Leather and Skin Object Care, Handling, and Storage**

The most successful method of preserving leather and skin products is a good preventive conservation program. This program needs to include systematic collection care, handling and storage practices, and regular inspection and condition evaluation. This approach replaces the traditional practices and remedies of the past that have been found to be detrimental to museum objects.

For longer life of skin and leather objects follow these general guidelines:

- Identify the general category of the skin product correctly.
- Understand the product's basic characteristics, as well as its deterioration features.
- Upgrade the general environment that includes controlling climatic conditions, minimizing light exposure, providing physical support, and protecting from mishandling, soil accumulation, and pest infestation.

- Inspect, evaluate, monitor, and document an object's condition, periodically; record the urgency for conservation treatment.
- Provide specialist care for those objects requiring complex or considerable conservation treatment.

And follow these specific guidelines:

1. *How do I provide a stable and appropriate humidity?*

Use enclosures such as exhibit cases or storage cabinets to stabilize humidity and reduce handling, soil accumulation, and attack from microorganisms and insects.

Set relative humidity to an acceptable range: less than 5% RH change within a 24-hour period and an annual change of no more than $\pm 8\%$ fluctuation from the set point.

Humidity parameters are frequently 40%-60% RH; however, the specific set points will vary according to:

- climatic considerations
- an object's state of deterioration
- your facility's air handling capability
- requirements of any composite and associated materials present
- the relative humidity with which the object has reached equilibrium

2. *How do I monitor the condition of objects?*

Inspect objects for deterioration regularly. If you do not regularly evaluate and document their state of degradation, deterioration of leather and skin objects can go undetected and unchecked. Evaluate the condition of objects thoroughly when they are acquired. Then, inspect the objects periodically to identify progressive damage, such as lengthening of tears, increases in surface or pigment loss, and evidence of biological attack. Finally, use a conservator to assist in periodic surveying of significant objects in order to establish conservation treatment needs. See *MH-I*, Chapter 3, *Museum Objects Preservation: Getting/Started*, for guidance on Collection Condition Surveys.

3. *How do I clean objects?*

The degree to which each soiled object can be cleaned is a function of the nature of the soil and the sensitivity of the object. Clean an object only as necessary to remove airborne soil accumulation.

Don't directly apply chemical reagents such as cleaners, dressings, waxes, and coatings: they are not beneficial and will complicate future conservation treatment.

You can't remove some surface soils by simple cleaning methods, and other soils are not removable at all. Highly deteriorated objects cannot be cleaned by routine procedures so degraded surfaces should be noted and protected so that cleaning will be avoided.

When decorative elements on an object are extensive and very delicate, refer cleaning to a professional conservator. Surfaces that have specialized finishes also may require exemption from cleaning. Figure S.5 describes cleaning techniques that can be considered for objects in good condition.

4. *How do I handle skin and hide materials?*

Much of the damage caused to leather and skin products is due to improper handling. Therefore, you need to train staff in proper handling techniques. See *MH-I*, Chapter 6, Handling, Packing, and Shipping Museum Objects, for general handling rules.

In addition to the general rules there are a few essential rules for the safe handling of these objects:

- Be prepared before handling these objects by having a clean area ready to receive the object. Arrange for assistance from others when necessary.
- Consider the weight of the entire object before lifting; aged and deteriorated fibers cannot tolerate much physical stress. Avoid suspending, creasing, and folding items.
- Move leather and skin artifacts on a tray support, in a drawer, or in a box; if direct handling is necessary, use both hands and support the object from underneath, not from original handles and straps.
- Accommodate the special handling requirements of appendages and decorative elements such as beadwork and dangles.
- Handle skin and hide materials only while wearing clean, cotton gloves; if hand contact is required, wash hands just before handling.

See MH-I, Appendix I, Curatorial Care of Archeological Objects, for a discussion of support trays for objects.

5. *What about catalog labeling?*

Marking and labeling leather and skin artifacts for cataloging purposes can present a number of preservation problems:

- The porous, absorbent nature of all skin products can cause labeling inks, paints and varnishes to be absorbed into the skin tissue causing irreversible staining and stiffening.
- The adhesives associated with commercial labeling tapes have poor long-term stability.
- Pressure sensitive tapes and embossed plastic tapes tend to fall off in time, and their adhesives are generally not removable from the skin.
- Any type of metal tag (including aluminum) or metal ringed tag can cause corrosion. Aluminum in contact with skin and hide materials causes dark spots on the surface of the object.

Cleaning Techniques	Tools	Caution
VACUUMING - This is the safest cleaning method, if carefully executed.	Use fine plastic screening and a vacuum cleaner with adjustable suction or a rheostat and a small standard nozzle attachment.	Screening between the leather and the nozzle protects the leather, but movement of the screen can also cause abrasion. Flaking surfaces and loose parts may be accidentally removed.
DUSTING - This is the most frequently used technique. It can be combined with vacuuming.	Use camel hair brushes.	Dust acts as an abrasive; each time a material is brushed, surface material may be removed. Brushing also increases the danger of knocking off delicate pieces.
FORCED AIR - Compressed air cleaning must be done outside the collection area or dust will simply be redistributed.	Use a compressor, air hose, and broad compressed air nozzle.	Loose or fragile pieces can be blown off if too great a pressure is used; 40 pounds/square inch is maximum.
ARTIST'S ERASER - This method can occasionally remove stubborn surface deposits from the grain side of firm, intact leathers and skins.	Use artist's block or powder eraser. (Testing has shown "Magic Rub" block and "Scum X" powder to be the least damaging.)	This technique is not useful on deteriorated surfaces or where skin or decorative layers may be susceptible to flaking. Remnants of the eraser may become deposited in textured surfaces and require vacuuming.

Figure S.5. Cleaning Techniques for Leather and Skin Objects in Good Condition

You can determine the specific labeling technique you will need by considering the individual object. Maintain consistency throughout the collection and use the least damaging method. Consider both indirect and direct labeling.

- Indirect labeling allows you to avoid irreversibly damaging the hide material with ink. The two recommended methods of indirect labeling are tie-on tags and fabric labels.
 - Make tie-on tags from high quality, acid-free paper products or inert plastic materials. Corners should not be sharp. Attach tags in a manner that does not cause undue stress, such as to an orifice, strap or handle. Use soft cotton string or a non-abrasive plastic loop for attachment.
 - If you can't label an object with a tie-on tag, use a fabric label, such as those made from cotton twill tape or non-woven spun-bonded polyester; these can be sewn to soft skin products using a beading needle and single strand, white cotton thread. You can usually attach these labels without passing completely through the skin, and you can limit stitches to the upper edge of the label. Attach at a seam or inconspicuous area of the skin or hide material, or loop to a permanent strap.

- Direct labeling on skin products can be recommended only for firm leathers and rawhide. You can apply a barrier coating or ground of clear Acryloid B-72 resin to a small, inconspicuous area (approximately 1 cm x 3 cm in size). When dry, apply the catalog number directly. The ink should have different solubility than that of the ground resin, so it may be changed if necessary.

See NPS Conserve O Gram 1/4, Use of Acryloid B-72 Lacquer for Labeling Museum Objects and the Museum Handbook, Part II, Chapter 3, Cataloging. In addition to normal health precautions, exercise additional caution when using solvents around leather and skin products because excessive amounts can cause deterioration.

Label the object neatly in the most inconspicuous place possible. Your labels should be small yet clearly readable from a distance of one foot. Use a high quality and iron-free ink, such as India ink.

6. *How do I provide adequate physical support for objects?*

Most organic materials lose their structural integrity as they age. Collapsed, creased, or folded materials will develop local weaknesses and damage if not protected by custom mounts and supports.

Use high quality, non-reactive materials:

- rigid acrylic sheeting
- acid-free matboard and unbuffered paper tissues
- washed and undyed cotton and linen fabrics
- polyester batting
- polyethylene foam products

Attached components can cause deterioration when in contact with other materials (such as metal parts). Separate components by a barrier of polyethylene sheeting or layers of acid-free tissue.

7. *How do I store objects properly?*

Store skin and leather objects in a space that is dedicated to the storage of museum collections, where climate control and security can be adequately controlled. Although storage requirements vary somewhat for individual leather and skin materials, basic conservation principles recommend that you provide a spacious and secure storage area, appropriate cabinets and containers, an area that is as free as possible from environmental threats, and individual storage supports. See *MH-I*, Chapter 7, Museum Collections Storage, for guidance on storage of museum collections.

The storage needs of tanned and untanned materials can be discussed at two levels. The first level addresses the overall collections storage facility with its system of shelving, cabinets, drawers, and trays. The second level focuses on individualized object supports. The following discussion provides more guidance based on these basic principles.

- *Provide Appropriate Cabinets and Containers*

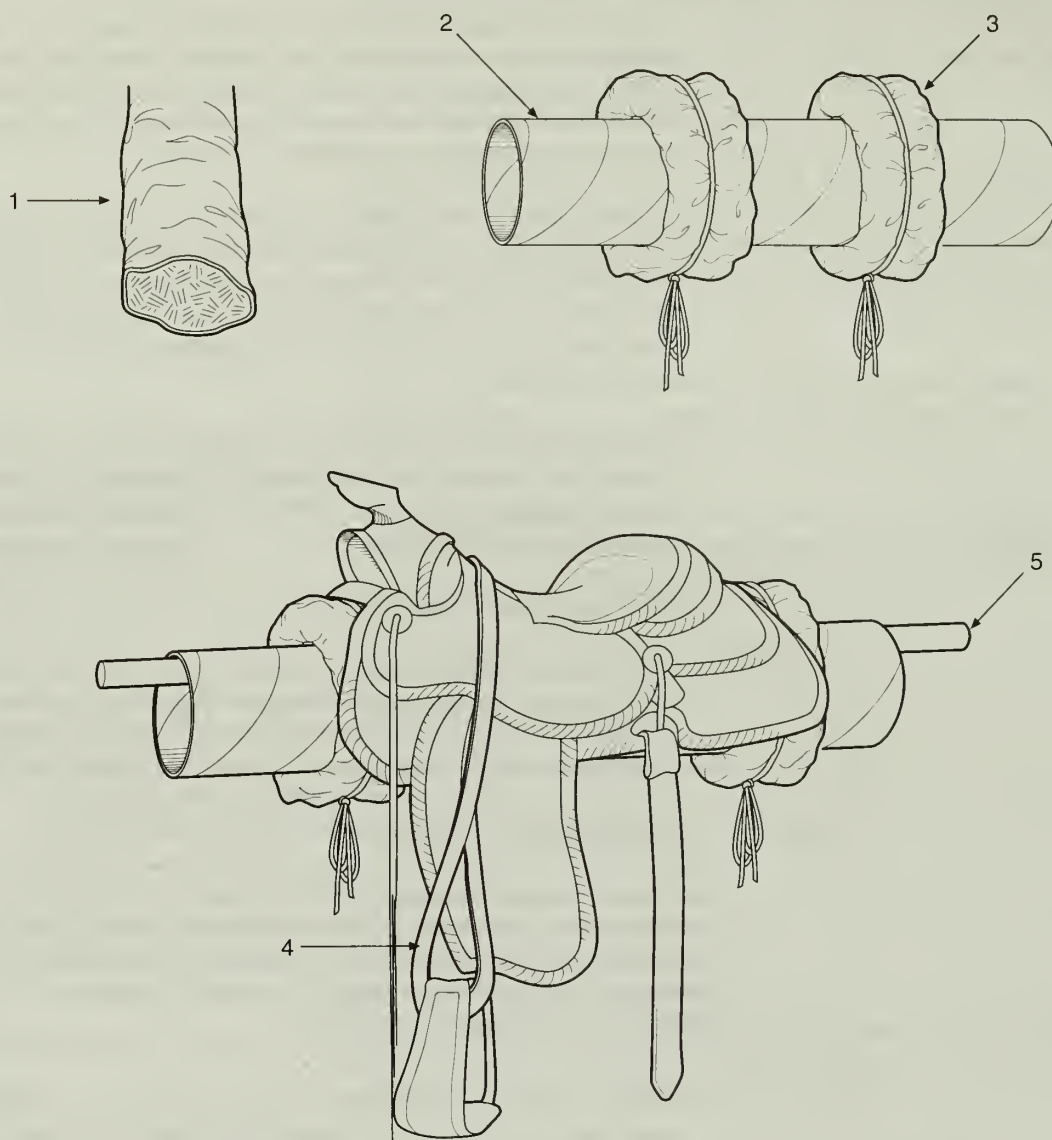
- Protect objects made of skin products within cabinets or on shelving with dust covers. Items should not be piled, folded, squashed or leaned. Use cabinets and storage furniture made of metal with a baked enamel finish. Don't use wooden cabinets and shelving, because wood products emit damaging vapors.
- Use storage trays and containers to house and support individual objects as well as to reduce stress and damage during handling. Any material that directly contacts the specimen, such as boxes, tubes and tissue papers, must be of acid-free unbuffered paper. Limit your use of plastics to pure polyethylene, acrylic and polyester products.
- Vacuum and dust your storage areas regularly. Dust is acidic, abrasive and damaging to these materials. Routine and systematic housekeeping also lessens the chance of insect problems that can harm leather and skin objects.

- *Provide Individual Storage Supports*

- You will need custom supports for many leather and skin artifacts just as you do for other sensitive organic materials. As skin products age, they become more susceptible to damage resulting from the lack of physical support. Many three dimensional objects and most large objects (such as saddles) have additional requirements for either internal or external reinforcement.

Individual supports shouldn't constrict or interfere with the expansion and contraction of the skin materials, restrict the gain and release of moisture as the hide responds to environmental changes, be permanently attached to the object, or provide harborage for damaging insect pests.

- Use supports to provide specific reinforcement to all vulnerable areas that are prone to damage under the object's own weight or because of the limitations of the storage container. Disfigurement and folding of skin materials frequently leads to permanent deformity, the straining of fibers and eventual cracking.
- The design and materials (see page 16, item 6) you will use in your supports depends on the shape, weight and needs of the individual object. For instance, you can roll flat hides and robes around large diameter (minimum of 6" diameter) tubes. Store garments flat and stuffed with a light weight support to eliminate creasing. Place saddles on a rigid saddle tree or dummy support if fenders are likely to become deformed. See Figure S.6 for an illustration of how to construct a saddle mount.
- Hide objects can deteriorate because of poorly selected and inappropriate support materials. Harmful materials are those that emit damaging vapors and organic compounds.



1. Fabricate a muslin sleeve filled with acrylic polyester batting to a diameter of 4 to 5 inches. The padding should not be overly tight or loose to permit firm support.
2. Use a heavy cardboard tube 6" in diameter.
3. Tie the rings of the filled muslin sleeves around the cardboard tubes with twill tape in the location of the saddle bow (front) and hind bow (back) for full support. The acrylic polyester padding will compress to fill the interior dimensions of the saddle so that the saddle will not rock or slip when placed on the mount. The weight of the saddle should keep it in place, although the saddle can be tied to the padded tube with wide twill tape in the area of the cinch belt as an added precaution.
4. Loop a sling made of wide twill tape or a strip of muslin around the saddle to support the stirrups.
5. Use a metal pipe, length of slotted angle, or 2" x 4" wooden board to support the mount.

Figure S.6. Constructing a Saddlemount

E. Summary: Leather and Skin Product Deterioration and Preventive Care

The previous two sections discussed deterioration, the causes of deterioration, and ways to limit deterioration through preventive conservation efforts. Figure S.7 summarizes some of this information.

CONDITION	PROBABLE CAUSE	PREVENTIVE ACTION
Deformation (contraction, cockling, cupping, shrinkage)	Physical alteration during use, storage or exhibition.....	Support in unconfined space
	Desiccation.....	Raise & stabilize ambient RH
	Alternate wetting or drying.....	Use container to protect against humidity extremes
	Excessive heating.....	Lower ambient temperature
	Photochemical reaction.....	Filter UV radiation, lower visible light
Embrittlement (rigid, inflexible, brittle)	Disuse, absence of flexing.....	None available
	Desiccation.....	Raise and stabilize ambient RH
	Soil impregnation.....	Use container, filter air
	Deterioration, loss of fat.....	Filter UV radiation, lower visible light
	Detanning.....	Use container
	Photochemical reaction.....	Filter UV radiation, lower visible light
Low cohesive strength (weakened, powdering, separating, fibrous)	Poor manufacture.....	None available
	Mechanical abuse.....	Use container, eliminate handling
	Chemical air pollution.....	Use container, filter air
	High acidity.....	Use container, filter air, stabilize ambient RH
	Oxidation.....	None available
	Loss of fat or water content.....	Stabilize ambient RH
	Photochemical reaction.....	Filter UV radiation, lower visible light
Physical Damage (abrasion, tearing, splitting, holes, missing parts, disjointed section)	Historic usage.....	Support, limit handling
	Inherent stress.....	Support, limit handling
	Dimensional movement.....	Stabilize ambient RH
	Handling.....	Use container, limit handling
	Stitching failure.....	Use container, limit handling
	Adhesive failure.....	Use container, limit handling
	Biological attack.....	Inspect, initiate control program
Soil or stain accumulation (oiliness water staining)	Use during historical period.....	Document, identify using remaining characteristics
	Improper handling.....	Instruct staff in proper handling, limit handling
	Unprotected storage or display.....	Use container, filter air
	Unstable fat spew formation.....	Stabilize ambient temperature
Discoloration (fading, darkening, lightening)	Soiling or staining.....	Use container, filter air
	Excessive fat content.....	None available
	Acid deterioration.....	Use container, filter air
	Photochemical reaction.....	Filter UV radiation, lower visible light
Loss of grain layer or exterior surface	Morphological feature of skin.....	Use container, limit handling
	Poor manufacture.....	Use container, limit handling
	Mechanical abuse.....	Limit handling
	Uneven consolidation.....	None available
Loss of fur or hair (slippage, breakage)	Morphological feature of hair.....	Use container, limit handling
	Poor manufacture.....	Use container, limit handling
	Desiccation.....	Stabilize RH
	Insect attack.....	Initiate periodic inspection and control program

Figure S.7. Leather and Skin Product Deterioration and Preventive Care

F. Conservation Treatment Issues

Curators, collectors, and conservators alike have been guilty of relying on old treatments to preserve skin materials, and far too frequently they accepted the promotions of commercial products designed for contemporary leathers. This history of haphazard treatment and unsystematic evaluation of skin products has resulted in considerable damage and loss. Common criticisms of past treatments of skin and leather products are that preservation attempts have not differentiated among the distinct categories of skin materials and have relied too heavily on the application of "preservatives."

The traditional remedies and reagents once routinely used in museum collections are now being carefully scrutinized by museum conservators. With the aid of scientific investigation and the assessment of the results of past treatment, several important new directions are being taken. The findings on past treatments have not been encouraging.

The routine application of preservatives (such as saddle soaps and leather dressings) is discouraged.

1. What are the perils of saddle soap?

There are many problems associated with the use of "saddle soap" on historic and artistic objects made from animal skin products. With the best of intentions, this commercial product has been inappropriately applied to just about every form of skin material in the past.

"Saddle soap" was not developed as a cleaner, but as a 19th century leather conditioner. Its basic components of neatsfoot oil and cod or sperm oil were emulsified with soap in water to produce an emulsion fat-liquor introduced during early tanning. As a conditioner, saddle soap is considered obsolete by tanners today.

Its application has caused considerable permanent damage to skin and leather objects since its components cannot be easily rinsed out and adequately removed (as manufacturer instructions often suggest). Saddle soap effectively softens and emulsifies surface oil and dirt, however it usually distributes them deeper into the material. The mixture's high moisture content presents a hazard to aged skin materials that should not be wetted, as well as light colored vegetable and/or alum tanned leathers.

Commercial formulations of saddle soap differ in their ingredients, some containing abrasives and even colorants. Saddle soap quality fluctuates greatly among manufacturers.

Perhaps most importantly, conservators now suspect that the surface cracking on many older skin and leather objects may well be due to past "saddle soap" application. Avoid it.

2. What are the drawbacks of leather dressings?

The care of skin and leather goods has traditionally involved the routine use of leather dressings, solutions of fats and oils that lubricate skin products to increase flexibility. Modern research has shown, however, that the haphazard use of dressings has been the cause of considerable deterioration within museum collections.

These solutions should never be applied to Native-tanned materials or objects comprised of untanned or semi-tanned skin products. Avoid the use of leather dressings on museum objects.

Numerous drawbacks are associated with dressing of skin products. For example, dressings frequently:

- darken lighter colored leathers
- encourage biological attack
- form fatty spews at the surface
- oxidize over time and stiffen the material
- wick into surrounding materials
- soften original finishes and decoration
- cause dust to accumulate
- impede future conservation treatment
- contaminate the material for future analysis

3. *What about neutralization of acids?*

The chemical decay and disintegration of leather resulting from exposure to acids is a well-known problem and its solution for older leathers remains unresolved. Vegetable-tanned leathers produced since the mid-19th century frequently exhibit a condition of internal fiber degradation known as "red rot." The color of the leather actually reddens as the deterioration progresses. In its advanced state, affected leather will disintegrate into a powdery form.

This condition is most always associated with sulfuric acid, introduced either during the tanning process or from atmospheric contact with the contaminant sulphur dioxide. (Leather readily absorbs acid from the air.) Sulphur dioxide, when absorbed, becomes sulphur trioxide, which unites with water to form sulfuric acid, resulting in a devastating effect on collagen fibers. Certain vegetable tannages (the ones categorized as condensed tannins) have been identified as being much more susceptible to this mechanism of deterioration.

Modern leathers are fortified against acid formation by incorporating buffering salts that repress acid formation and action. Some of the museum preservation literature during the last decade recommended that older leathers be treated with similar buffering salts, such as potassium lactate and potassium citrate, to protect them from acid attack.

The problem that museum curators face is that there is no easy and safe method for long-term neutralization of acids that are present in historic leather objects. There are *three* drawbacks associated with the treatment of leather with standard buffering salt solutions:

- The salts must be introduced in an aqueous solution yet water can be very damaging to historic leather causing stiffening, color change and disruption of applied finishes.
- Salt solutions are meant only for vegetable-tanned leather and will de-tan and damage mineral-tanned materials; the applicator must, therefore, be able to distinguish between them, which is not an easy task.
- The addition of buffering salts will do nothing for leathers that have already begun to deteriorate from acid exposure.

The conservation field is looking at other methods of deacidifying leathers; vapor phase reagents and non-aqueous chemicals are being investigated. The importance of this conservation issue is clear to those involved, and acceptable procedures should be available to museum staffs in the near future.

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